ROD FACT SHEET

SITE

Name:	Applied Environmental Services
Location/State:	Glenwood Landing, Nassau County, New York
EPA Region:	II
HRS Score (date):	
NPL Rank (date):	454 (10/84)

ROD

Date Signed: June 24, 1991

Selected Remedy

Soils:	Soil Vapor Extraction
Groundwater:	Pump and Treat, plus bioremediation
Capital Cost:	$ 2,390,000
O & M:	$ 970,000
Present Worth:	$ 4,507,000

LEAD

Enforcement, New York State Dept. of Environmental Conservation
Primary Contact (phone): Andrew English (518-457-3395)
Secondary Contact (phone): Melvin Hauptman (212-264-2647)

WASTE

Type:	Ethylbenzene, toluene, xylene, chlorinated volatile organics
Medium:	Soil, groundwater
Origin:	Pollution originated as a result of improper storage and handling of hazardous wastes at this location.

RECORD OF DECISION

APPLIED ENVIRONMENTAL SERVICES SITE

ALSO KNOWN AS

SHORE REALTY SITE

NASSAU COUNTY, NEW YORK

ID NUMBER 130006

PREPARED BY

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

JUNE 1991

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Applied Environmental Services Site
Also Known As: Shore Realty Site
Glenwood Landing
Nassau County, New York
New York State Site Code: 130006

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Applied Environmental Services Site (also known as the Shore Realty Site) located in Glenwood Landing, Nassau County, New York, which was chosen in accordance with the New York State Environmental Conservation Law (ECL), and consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"). This decision document summarizes the factual and legal basis for selecting the remedy for this site.

Exhibit A identifies the documents that comprise the Administrative Record for the site. The documents in the Administrative Record are the basis for the proposed remedial action.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision ("ROD") may present an imminent and substantial threat to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy addresses the principle threats posed by the site by removing the source contaminants from the soils and groundwater.

The major elements of the selected remedy include:

- active venting, by vacuum extraction, of contaminated unsaturated soils;
- collection of contaminated groundwater from a series of shallow groundwater extraction wells;
- treatment of the collected groundwater by air-stripping;
- reinjection of treated groundwater along with nutrients and a chemical source of oxygen to stimulate the growth of indigenous bacteria capable of degrading contaminants in the groundwater and saturated soils; and

- treatment (e.g. catalytic oxidation) of contaminant laden vapors from the vacuum extraction and air-stripping processes before release to the atmosphere.

DECLARATION

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy may not allow for unlimited use and unrestricted exposure within five years after commencement of remedial action, a five year policy review will be conducted. This Level I evaluation will be conducted within five years after the commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

6-13-91
Date

Edward O. Sullivan
Deputy Commissioner
Office of Environmental Remediation
New York State Department of Environmental Conservation

6-24-91
Date

William J. Muszynski
Constantine Sidamon-Eristoff
Regional Administrator
United States Environmental Protection Agency

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RECORD OF DECISION
APPLIED ENVIRONMENTAL SERVICES SITE
AKA SHORE REALTY SITE (#130006)

I. SITE LOCATION AND DESCRIPTION

The Applied Environmental Services (AES) site, also known as the Shore Realty site, is located at One Shore Road, Glenwood Landing, Nassau County, New York. The site is listed in the New York State Registry of Inactive Hazardous Waste Sites as site number 130006 (see Exhibit B). The site is part of a small peninsula on the east shore of Hempstead Harbor directly north of Mott's Cove. Mudflats around the site, designed as tidal wetlands, are periodically exposed by falling tides. Figure 1 shows the location of the site with respect to Hempstead Harbor.

This 3.2 acre site is surrounded by industrial, commercial, and residential areas. Directly north of the site is a fuel oil terminal. Farther north is a LILCO power station including fuel oil storage tanks. To the east is a boat yard. The nearest residence is approximately 600 feet to the northeast. Figure 2 is a site plan showing approximate borders and the layout of surface structures (tanks, buildings, loading, platform, etc.).

There are no drinking water supply wells within one mile of the site. Twelve non-public groundwater wells within one mile of the site are used for industrial, irrigation, and observation purposes. The principal aquifers beneath the site include the Upper Glacial, Port Washington, and Lloyd aquifers. These aquifers are used to varying degrees as sources of groundwater. The Magothy aquifer, often used on Long Island as a source of drinking water, is not present under the site. Groundwater beneath the site discharges to Hempstead Harbor to the west and south.

II. SITE HISTORY AND ENFORCEMENT STATUS

A summary of the major events affecting the environmental conditions at the site is included as Exhibit C.

The Shore Realty property was first used for the bulk storage of petroleum products in 1939 by Texaco Oil Company. Texaco reportedly sold the property to Phillips Petroleum in 1964. Phillips used the property to store gasoline and fuel oil in above-ground tanks until 1972. In 1974 Circle Terminal Corp. leased the facility from Phillips. At some point in the same year, a part of the facility was also leased to the Mattiace Petrochemical Company (Mattiace), which used it for the storage and distribution of chemical solvents. Numerous spills of organic chemicals are reported to have occurred during the period of Mattiace's occupancy. In 1978, an overturned tank truck released approximately 3000 gallons of toluene onto the western portion of the site. Undetermined amounts soaked into the sandy soil and spilled into Hempstead Harbor.

In October 1980, Mattiace received 34 citations regarding the poor condition of the storage tanks and safety violations. Mattiace was also ordered by the New York State Department of Transportation and United States Coast Guard to initiate a clean up of the property but failed to comply with the orders.

In July 1980 Phillips sold the property to Messrs. Joseph Saleh and Amnon Bartur. The new owners, in turn, leased the property to Applied Environmental Services (AES) later that same year. AES operated the facility for the blending of various chemical waste materials that have a heat value to provide alternate fuel sources. It also operated a hazardous waste storage facility. A series of monitoring wells, a recovery trench (which was installed while the Site was still occupied by Mattiace), and a floating liquid chemical recovery pump were installed at the Site while occupied by AES. The trench is reported to have recovered approximately 500 gallons of liquid chemicals per month during 1981-82.

Shore Realty Corp. purchased the Site in October 1983. Shore Realty then evicted AES in January 1984. New York State filed suit against Shore Realty and its owner in February 1984. As a result of that suit, Shore Realty and its owner were ordered by the court to undertake certain remedial actions at the Site. Subsequent to that order, numerous third-party defendants, including the prior landowners, prior on-site operators, and a number of companies that allegedly sent chemicals to the Site while it was operated by AES, were brought into the case by Shore Realty. Between June and September 1984, Shore Realty removed 255 of 410 drums containing hazardous wastes which were stored on the property. Shore Realty then refused to remove the remaining drums and additional wastes in tanks and containers at the site.

In October 1984, the District Court granted an earlier request by the New York State Attorney General ordering Shore Realty to remove all of the remaining hazardous wastes from the site, an order affirmed by the U.S. Court of Appeals. Shore was held in contempt of court for failing to carry out the remediation of the site and fined $1,000/day until the cleanup was completed. This decision was appealed and upheld but remanded to the District Court to recompute the fine and determine Shore's financial condition.

In May 1985, the Commissioner of the New York State Department of Environmental Conservation (NYSDEC) determined that the site presented an imminent danger of further irreversible and irreparable damage to the environment. As a result, the NYSDEC hired a contractor to remove the hazardous wastes stored in tanks and containers at the site. The NYSDEC completed the removal of approximately 700,000 gallons of hazardous wastes from the site at a cost of over $3.1 million by the end of September 1986. More than half of this amount was used for the disposal of wastes contaminated with polychlorinated biphenyls (PCBs).

After being nominated to the federal National Priorities List (NPL) in October 1984, the site was incorporated into the list in June 1986. This step formalized the involvement of the United States Environmental Protection Agency (USEPA) in the process of investigating and remediating the site.

In February 1987 a number of companies that allegedly sent waste chemicals to the site, now referred to as the Common Defense Group, retained a consultant (Roux Associates, Inc.) to perform the Remedial Investigation and Feasibility Study (RI/FS) for the site. An RI/FS work plan was created to specify the steps needed to define the nature and extent of the contamination at the site and evaluate the feasible alternatives for remediating the site. The results of the RI are summarized below in Section V (Summary of Site Characteristics) and the conclusions of the FS are described in Section VIII (Summary of the Comparative Analysis of the Alternatives). Before the work plan was finalized, a public information meeting was held near the site to describe the methods and goals of the RI/FS and solicit public comment. The requirement to perform the RI/FS was incorporated into a court ordered stipulation signed September 16, 1987.

Investigations at the site began in October 1987. The first draft of the RI report was submitted in February 1988. A public notice of the availability of the draft report was issued in March 1988. Due to deficiencies in the report, it was rejected in May 1988. A revised report was submitted in August 1988 and was also rejected. A major problem with the report was that many of the analyses of samples from the site were found to be unreliable due to laboratory problems. The need to repeat much of the sampling and analysis work, along with the assessment that additional information was needed, led to the development of a supplementary RI work plan. After extensive negotiations, the supplementary work plan was approved in October 1989.

Field work began in November 1989 and the supplemental report was submitted in April 1990. A revised report that combined both phases of the RI was submitted in August 1990. The first draft of the FS was submitted in September 1990. The reports were rejected in November of 1990 and resubmitted in February, March, and April 1991. The April 1991 reports were accepted for the purposes of preparing the Proposed Remedial Action Plan and for public inspection.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

Concurrent with the investigations and remedial measures performed at the site, there has been significant community involvement and input into the project. Between 1984 and 1987, regular meetings were held between interested citizens and federal, state, county, and local officials as often as once per month.

Before the work plan for the Remedial Investigation and Feasibility Study (RI/FS) was finalized, a public meeting was held at the nearby North Shore High School (August 12, 1987). Six local information repositories were established and the transcript from the meeting was placed into the repositories. A citizen participation workplan was developed by the NYSDEC in early 1988. As part of the plan, a public contact list was developed and used to disseminate fact sheets, meeting announcements, and other information. The Citizen Participation Plan has been placed into the document repositories. A news release, public notice, and fact sheet were issued to announce the plan and summarize developments to that date.

When the first draft of the Remedial Investigation Report was submitted in February 1988, a news release and public notice were issued, and a fact sheet, briefly describing the draft report, was also distributed. Upon the receipt of the first draft of the Feasibility Study in September 1990, another news release, meeting notice, and fact sheet were issued. A public meeting was held on September 18, 1990 to describe the revised RI Report and the FS and again solicit comments. The RI/FS reports were also placed in the repositories.

A notice of the availability of the final drafts of the RI/FS Reports and the Proposed Remedial Action Plan (PRAP) was published on April 17, 1991. Additional methods used to encourage public participation included publishing a series of announcements in local newspapers, mailing notices and a fact sheet to the project contact list, mailing notices to residents in the vicinity of the site, obtaining assistance from the local school board, and other methods. The reports, the Proposed Remedial Action Plan (PRAP), and the Administrative Record for the project were placed into the repositories. A formal public meeting was held on May 15, 1991 to present the PRAP and seek public comment. A responsiveness summary has been prepared containing responses of the NYSDEC and EPA to comments received during the public meeting and comment period (Exhibit D).

IV. SCOPE AND ROLE OF RESPONSE ACTION

The remedial action selected in this decision document addresses the entire site and the areas immediately surrounding the site. As discussed in more detail in Section V below, the primary media contaminated include site soils and groundwater. Surface water (Hempstead Harbor), surface water sediments, and ambient air above the mudflats have been contaminated as a result of contaminants migrating with site groundwater or through site soils.

By directly removing contaminants from the soils and groundwater, the response action will remove the source of contaminants from the remaining indirectly contaminated media. The remediation of the site will be complete after the response action has been implemented.

V. SUMMARY OF SITE CHARACTERISTICS

For ease of reference, Table 1 summarizes the main characteristics of the Shore Realty Site.

Summary of Field Investigations

The following paragraphs summarize the components and conclusions of the field investigations performed at the site. For more detailed information regarding the individual investigations or for additional regional information, refer to the Remedial Investigation Report listed in the Administrative Record (Exhibit A).

After the removal of hazardous wastes from tanks and containers at the site in 1985-86, it was necessary to determine the nature and extent of the subsurface (i.e. soil and groundwater), sediment, and air contamination. The Remedial Investigation (RI) designed to accomplish these goals was completed in two phases.

The first phase was carried out from October 1987 through January 1988 and included the following tasks: (1) a reconnaissance program; (2) installation of nine groundwater monitoring wells; (3) sampling and analysis of groundwater from 15 monitoring wells; (4) collection and analysis of 30 soil samples; (5) collection and analysis of eight sediment samples; (6) performance of a site-wide soil gas survey; and (7) an assessment of the hydrogeologic conditions at the site.

Figure 3 shows the location of sampling points during both phases of the RI. The second phase of the RI included (1) the installation of two additional groundwater monitoring wells to evaluate deeper groundwater conditions; (2) sampling and analysis of groundwater from 16 monitoring wells; (3) collection and analysis of 32 soil samples; (4) collection and analysis of 17 sediment samples; (5) collection and analysis of five air samples; and (6) updating the hydrogeologic assessment.

The contaminants found at the site can be grouped into the general categories of volatile organics, semi-volatile organics, and metals. The contaminants that are present in the highest concentrations are the volatile compounds ethylbenzene, toluene, and xylenes (ETX). PCBs were detected in only one unconfirmed sediment sample at 99 parts-per-billion (ppb). Pesticides were not found at the site. The distribution of the contaminants is best described by addressing the individual media of soil, groundwater, sediments, and air. The following discussion gives representative examples of the findings.

Soils

Soils at the site can be divided into four "horizons," A through D (see Figure 4). The A-horizon includes soils from five feet above the water table to the ground surface. Toluene and xylenes were found at low concentrations (39 ppb and 38 ppb respectively). Metals were also detected at low concentrations, the highest being zinc at 224 ppb and lead at 47.4 ppb.

The B-horizon, the most contaminated soil layer, includes soils five feet above to three feet below the water table. ETX was found in 18 of 27 samples at concentrations (sum of the three) up to 10,700,000 ppb (approximately one percent). Chlorinated volatile organics (e.g. trichloroethane and its degradation products) were found in six of 29 samples at concentrations up to an estimate of 20,000 ppb (methylene chloride). Polycyclic aromatic hydrocarbons (PAHs, e.g. naphthalene) were found at concentrations up to 13,000 ppb (2-methylnaphthalene). Phthalates were found in four of the five valid samples at concentrations up to 12,000 ppb (bis(2-ethylhexyl)phthlate). Metals are evenly distributed across this layer at concentrations somewhat higher than in the A-horizon (e.g. highest levels of lead and zinc at 87.6 ppb and 786 ppb, respectively). The presence of additional volatile organics may have been masked by high detection limits caused by the very high concentrations of ETX.

The C-horizon includes soils between three and 15 feet below the water table. The concentrations of ETX are lower than those in the B-horizon but are significant (e.g. xylenes up to 39,000 ppb). Methylene chloride was found in two samples at 6 ppb and 370 ppb. PAHs and phthalates were found in two samples at concentrations of 130 and 1600 ppb respectively. Metals were not detected.

Five soil samples were taken in the D-horizon which includes soils greater than 15 feet below the water table. Concentrations of ETX compounds are below 100 ppb except for one location with xylenes at 2,200 ppb. Tetrachloroethene was detected at one location at an estimated concentration of 4 ppb.

Horizontally, the areas of highest soils contamination are along the western portion of the site (access road and bulkhead) and under the elevated tank farm.

Groundwater

Similarly to soils, groundwater contamination can be described in terms of three levels; water table (WT-series), shallow (SW-series), and deep (DW-series). Although somewhat influenced by the tides, groundwater generally moves from east to west across the site and discharges into Hempstead Harbor. The sandy soil, along with the presence of an elevated and bermed tank farm, combine to form a groundwater mound in the center of the site. The impacts of the mound and the harbor on the direction of groundwater flow lessen with depth. The hydraulic conductivity and groundwater velocity are estimated to be 0.02 cm/sec and 0.55 m/day, respectively.

The WT-series wells along the western portion of the site show heavy contamination, particularly with ETX compounds (maximum is toluene at 350,000 ppb). Chemicals floating on the water table captured by these wells contribute to these high values. Other non-chlorinated, chlorinated, semi-volatile, and metal contaminants are present in this level. The high concentrations of ETX may mask the presence of additional contaminants. WT-series wells along the eastern portion of the site are relatively uncontaminated although some exceedances of groundwater standards have been found (e.g. tetrachloroethene at 49 ppb).

The SW-series wells, screened at the interface of the C and D soil horizons, show low-level contamination by chlorinated volatile organic compounds (e.g. tetrachloroethene at 22 ppb). The data indicate that there may be an off-site source of contamination, however, there are no adequate off-site, upgradient, wells to confirm or disprove this. The DW-series wells, screened approximately 52 feet below the water table, are uncontaminated.

Sediments and Surface Waters

The analyses of sediment samples taken from the tidal mudflats in Hempstead Harbor and Mott's Cove show contamination by semi-volatile compounds and metals (e.g. benzo(b)fluoranthene, bis(2-ethylhexyl) phthlate, lead) at individual concentrations generally less than 1,000 ppb. The vertical distribution of the contaminants and the low concentrations of volatile contaminants suggest that the main source of contamination is the discharge of shallow groundwater onto the mudflats during low tide. There are no ARARs for the sediments, but some of the PAHs and metals exceed guidance values established by the NYSDEC. The distribution of contaminants indicates that there may be off-site sources contributing to the PAH contamination in the sediments.

Surface water contamination exceeding New York State water quality standards is evident in the surface sheen visible adjacent to the site.

Air

Since it is known that groundwater contaminated with volatile organic compounds discharges onto the mudflats, air samples were taken above the mudflats during low tide to evaluate air emissions. ETX and benzene were detected. Benzene was detected in three of the five samples at concentrations higher than the NYSDEC Ambient Guideline Concentration (AGC) of 0.12 ug/m^3 (highest concentration was 3.23 ug/m^3 or 1 ppb). The remaining compounds were detected at levels within the AGCs. It should be noted that compounds volatilizing from soils also present air releases. This pathway is addressed in the risk assessment.

VI. SUMMARY OF SITE RISKS

In accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 CFR Part 300), a baseline risk assessment has been completed as one component of characterizing the site. The results of the baseline risk assessment are used to help identify applicable remedial alternatives and select a remedy. The components of the baseline risk assessment for this site are as follows:

- a review of the site environmental setting;
- identification of site-related chemicals and media of concern;
- an evaluation of the toxicity of the contaminants of concern;
- identification of the possible exposure routes and pathways;
- estimation of intake rates, incremental risks and hazard indices; and
- an evaluation of the impacts of the site upon the environment.

Exposure routes are the mechanisms by which contaminants enter the body (e.g., inhalation, ingestion, absorption). Exposure pathways are the environmental media (e.g., soil, groundwater, air, etc.) through which contaminants are carried.

The risk assessment for this site (Chapter 3 of the Feasibility Study) has identified the soils at the site as the most likely medium for which a complete exposure pathway exists on a continuous basis at the site. This pathway includes the release of volatile organic compounds from the surface of the soils and subsequent inhalation by potential site residents. A non-continuous pathway is the air over the mudflats at low tide. During the time where the mudflats are exposed, volatile organic compounds evaporate and produce concentrations that exceed state guidelines.

To estimate exposure rates, representative compounds were selected, conservative assumptions were made, and lifetime intake rates were calculated for the routes of inhalation, ingestion, and dermal absorption. Five different usage scenarios were evaluated; commercial use; recreational use by adults, recreational use by children, residential use, and exposure to chemicals associated with the sediments in the mudflats. Although the site and the area immediately surrounding the site are industrial in nature, the site was purchased by Shore Realty ostensibly for residential development. Therefore, it was appropriate to evaluate residential and recreational exposure scenarios in the risk assessment. Contaminants were divided into two categories, those that are possible/probable carcinogens, and those that may cause non-cancer health effects (systemic toxicants). Toxicity data was obtained from the Integrated Risk Information System (IRIS) and the Risk Assessment Guidance for Superfund (RAGS).

The results of the assessment indicate that left unremediated, the residential use scenario would present an incremental risk of cancer of approximately 9 X 10-5 (see Table 2). That is, living at the site for a lifetime could increase an individual's risk of developing cancer by nine in one hundred thousand. This results primarily from the inhalation of methylene chloride and benzene which volatilize from site soils. Note that there are no site residents or current users and that the site is secured by chain link fence. Trespassers could be exposed to contaminant vapors but not at significant levels. Persons walking across the mudflats could be exposed to contaminated groundwater and vapors.

For the purposes of the risk assessment, methylene chloride and benzene were assumed to be present in site soils at concentrations of 20 ppm and 3.7 ppm respectively. Methylene chloride was found in only one sample at 20 ppm and the laboratory blank for this sample was found to contain the contaminant. Benzene was detected in only one soil sample (at 0.005 ppm) but concerns about masking indicated the need to assume that benzene was present in soils at the detection limit.

The increased risk of 9 X 10-5 exceeds the one in one million (or 10-6) risk level used by New York State to indicate that remedial action may be needed. Contaminants in excess of State and federal standards were detected in groundwater at the site. EPA policies and regulations allow remedial actions to be taken whenever cross-media impacts result that exceeds one or more maximum contaminant levels (MCLs), which are enforceable water standards. The State and federal MCLs are set at levels that are protective of human health. Consequently, site remediation is warranted to remove this continuous source of contamination and expedite compliance with State and federal groundwater standards.

The risks associated with exposure to noncarcinogenic contaminants are determined using the "Hazard Index" approach. The Hazard Index is a comparison of potential levels of exposure to site-related contaminants with conservative estimates of an acceptable level of exposure. For noncarcinogens, a Hazard Index greater than one indicates that adverse noncarcinogenic effects may occur, while a value below one indicates that such effects are unlikely to occur. At this site, the total Hazard Index for exposure to noncarcinogenic related contaminants is less than one, suggesting that adverse noncarcinogenic effects are not likely to occur.

The environmental assessment has identified impacts to marine life, including reduced species diversity and observed stress in translocated benthic species, resulting from the contamination of the site. Impacts directly attributable to the site upon marine plant and animal life appear to be limited to the bulkheads and sediments directly adjacent to the site. This is thought to result primarily from the discharge of non-aqueous phase chemicals floating on the water table into the harbor.

There are a number of assumptions, uncertainties, and limitations associated with these estimates that are addressed in the Feasibility Study. In general, the main sources of uncertainty include:

- nature of receptor population;
- VOC emission rates;
- modelling of exposure levels;
- accuracy of toxicological data; and
- the complex interaction of the uncertainty elements.

For example, the risk assessment identified receptor populations based upon reasonable potential exposure scenarios. The most conservative scenario assumed that individuals would reside on-site for a lifetime. Other scenarios were also evaluated for comparison purposes. The actual risk incurred would be dependent upon the actual location of the most exposed individual(s) and the duration of their exposure.

The mathematical models used to estimate the concentrations of contaminants presented to receptors contain many assumptions that can affect results. The input parameters to the models (e.g. meteorological data) also have uncertainties that influence the output of the models. Much of the toxicological data used is extrapolated from animal studies to estimated human impacts. Often these studies are performed at high concentrations and produce results that may not occur at lower levels. Additionally, these and other uncertainty factors combine in ways that can increase the overall uncertainty of the results. These uncertainties are addressed by making conservative assumptions concerning risk and exposure parameters throughout the assessment. As a result, the risk assessment provides upper bound estimates of the risks to populations at the Site, and is unlikely to underestimate actual risks related to the Site.

The increased risks identified by the baseline risk assessment in combination with concerns regarding the criteria described below (especially exceedances of New York State groundwater standards) indicate the need to actively remediate soils and groundwater at the site. Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

VII. DESCRIPTION OF THE REMEDIAL ALTERNATIVES

To determine the most appropriate method for remediating the site, the feasibility study completed a process that can be described in three parts. The first step identified and "screened" a large number of technologies that could be employed at the site to treat, contain, or dispose of the contaminants. Technologies that passed the initial screening phase were then grouped into different combinations to form remedial alternatives for further evaluation. After an initial analysis to identify the most promising alternatives, a detailed analysis was performed to serve as the basis for selecting a preferred alternative. This process is described in more detail in the following subsections.

Compilation and Screening of the Technologies

The results of the remedial investigation indicate that five media in and around the site have been contaminated as a result of the improper management of hazardous materials and wastes. These media are site soils, site groundwater, the tidal sediments adjacent to the site, surface water

(Hempstead Harbor), and the air. It has been concluded that three of the five media (i.e. sediments, surface water, and air) are being indirectly contaminated as a result of the direct contamination of the soil and groundwater at the site.

The discharge of contaminated groundwater from the site into Hempstead Harbor (and Mott's Cove as part of Hempstead Harbor) results in contaminants being transferred into the sediments, the surface water, and by evaporation, into the air. Additionally, contaminants in the soils leach into the groundwater, evaporate into the air, and have the potential to transfer to people and biota that come into contact with contaminated soils. Therefore, the saturated and unsaturated soils at the site are considered the principal threats posed by the site.

Therefore, the initial screening process focused upon soil and groundwater with the understanding that by directly addressing these two media, the other three media would be addressed by virtue of removing the source of contamination to the sediments, surface water and air.

To generate alternatives capable of addressing the contamination of each medium, the three progressively more specific categories of "general response actions," "remedial technologies," and "process options" were identified. For example, regarding soil, one of the general response actions considered was containment. This was then subdivided into the two remedial technologies of capping and vertical barriers which was further subdivided into the process options of synthetic, asphaltic, and layered caps along with sheet piling and slurry walls as vertical barriers. A summary of the 12 general response actions, 19 remedial technologies, and 41 process options considered is given in Table 3.

The initial screening process essentially consists of evaluating all of the identified process options against the single criterion of technical implementability. This also includes the evaluation of the "No Action" alternative which is carried through the entire process to demonstrate the need for remediation at the site and as a requirement of the NCP.

The following list indicates the process options which did not pass initial screening and a brief explanation for their exclusion.

Medium	Technology/Process Option Excluded	Reason
soil		
	-solidification/stabilization	-not effective for site wastes
	-land farming	-inadequate site conditions
	-off-site pyrolysis	-not applicable to site wastes
	-on-site RCRA landfill	-inadequate site conditions
	-in-situ chemical treatment	-not applicable to site wastes
groundwater		
	-vertical barriers	-not effective
	-oil-water separation	-insufficient "oil" phase
	-precipitation/flocculation	-not applicable to site wastes
	-ion exchange	-not applicable to site wastes
	-chemical reduction	-not applicable to site wastes

Process options that were found to be technically implementable as a result of the screening process are as follows:

Process Options Retained for Further Evaluation

Soil	Groundwater
-no action	-no action
-containment (layered capping)	-containment (layered cap)
-containment (sheet piling)	-extraction
-off-site disposal	-air stripping
-off-site incineration	-in-situ soil venting
-on-site incineration	-in-situ biodegradation
-on-site thermal desorption	-discharge to POTW
-in-situ vapor extraction	-discharge to harbor
-in-situ biodegradation	-reinfiltration

A detailed discussion and evaluation of the initial screening process can be found in Chapter 5 of the Feasibility Study.

Evaluation of the Alternatives

Initial Screening

The remedial technologies and process options that passed the screening process were then assembled into nine different combinations or remedial alternatives. Theoretically, an immense number of combinations are possible but the NCP provides guidance (40 CFR 300.430(e)(3)) for how to assemble suitable technologies into alternative remedial actions for evaluation. Three sets of alternatives are described: (1) a range of alternatives that remove or destroy contaminants to the maximum extent feasible and eliminate or minimize to the degree possible, the need for long-term management; (2) "other alternatives which, at a minimum, treat the principal threats posed by the site but vary in the degree of treatment employed and the quantities and characteristics of the treatment residuals and untreated waste that must be managed;" and (3) "one or more alternatives that involve little or no treatment, but provide protection of human health and the environment primarily by preventing or controlling exposure to ... contaminants, through engineering controls" and other methods to "assure continued effectiveness of the response action."

The following nine remedial alternatives were constructed and evaluated against the short and long-term aspects of three of the balancing criteria; effectiveness, implementability, and cost (see Section VIII below for descriptions of the criteria).

Initial List of Remedial Alternatives

1. No Action/Monitoring.
2. Multilayered RCRA cap + groundwater extraction + discharge to POTW + monitoring.
3. Soil excavation + off-site incineration + monitoring.
4. Sheet piling vertical barrier + dewatering + water treatment + soil excavation + off-site incineration + monitoring.
5. Partial soil excavation + on-site thermal desorption + monitoring.

6. Groundwater extraction + air stripping + discharge + monitoring.
7. In-situ soil venting + monitoring.
8. Sheet piling vertical barrier + dewatering + water treatment + in-situ soil venting + monitoring.
9. In-situ soil venting + groundwater extraction + air stripping + in-situ biodegradation + monitoring.

The initial screening of these alternatives against the three balancing criteria mentioned above took the following factors into consideration.

The effectiveness evaluation considers:

a. the degree to which the alternative under consideration reduces the toxicity, mobility, or volume of the contaminants through treatment;

b. how residual risks are minimized;

c. how long-term protection is provided;

d. how ARARs are complied with;

e. how short-term risks are minimized; and

f. how quickly the alternative achieves protection.

The implementability evaluation considers:

a. technical feasibility (ability to design, construct, and operate the alternative); and

b. administrative feasibility (availability and capacity of services, equipment, and personnel along with the ability to obtain the necessary approvals from involved regulatory agencies).

The cost evaluation considers:

a. capital costs for design and construction;

b. operation and maintenance costs; and

c. the present worth of all costs for comparison purposes.

The result of the initial screening process was to reject three of the nine alternatives. The reasons for rejecting these three are given below.

Alternatives Rejected

Alternative 2: Multilayered RCRA cap + groundwater extraction + discharge to POTW + monitoring.

This alternative would reduce the infiltration of precipitation into site soils by installing a multi-layer surface cap designed in accordance with the requirements for secure landfills under the Resource Conservation and Recovery Act (RCRA) and its amendments. Reducing infiltration would reduce the amount of contaminated groundwater that is generated. A groundwater extraction system would be installed and operated to reduce or eliminate the discharge of groundwater contaminated to levels above ARARs into the harbor. Colle d groundwater would be discharged into a nearby sanitary sewer line subsequent treatment at the local Publicly Owned Treatment Works (POT .

The alternative was rejected for a number of reasons. Overall, its long-term effectiveness is dependent upon the successful operation, for many years, of an active collection and disposal system along with maintenance of the cap. The alternative is much less effective than other alternatives in achieving the remedial objectives. Although the mobility of the contaminants would be reduced, it would take decades to reduce the overall volume of contaminants and their toxicity would not be altered. Risks would be controlled by containment and isolation which is less preferable than a permanent remedy that removes contaminants directly. Although technically feasible, it would likely be administratively infeasible due to the difficulty of obtaining approval to discharge untreated groundwater laden with contam nants to the local POTW.

Alternative 3: Soil excavation + off-site incineration + monitoring.

In this case approximately 30,000 cubic yards of the most contaminated soils would be excavated and transported off-site for treatment at a commercial hazardous waste incinerator. Soils would be excavated to a depth three feet below the existing water table. Clean fill would be brought to the site to replace the excavated material. Long-term groundwater monitoring would be needed to evaluate the effectiveness of the alternative in improving groundwater quality.

Although there would be a significant reduction in the volume and mobility of the contaminants in the unsaturated and shallow saturated soils, deeper soils and contaminated groundwater would not be addressed. The protectiveness of the alternative would be no greater than alternative 5 and would cost an order of magnitude more. Significant risks from the transportation of a large amount of contaminated soil long distances would likely be incurred. Groundwater ARARs would largely not be met, exposure pathways would remain, and the discharge of contaminated groundwater would continue to impact sediments, surface water, and by evaporation, air. For these reasons, the alternative was rejected.

Alternative 6: Groundwater extraction + air stripping + discharge + monitoring.

Shallow groundwater would be collected along most of the border between the site and the harbor using either recovery wells, well points, or a collection trench. Extracted water would then be treated using a counter-current air stripping tower. Treated water would be either discharged to the harbor or the local POTW. Air emissions from the air stripping tower would be treated by catalytic oxidation to prevent exceedances of air quality standards. Long-term monitoring would be needed to monitor the effectiveness of the alternative.

Although the alternative would reduce or eliminate the discharge of contaminated groundwater to the harbor, it would do so without addressing the source of groundwater contamination (i.e., contaminated soils) and would probably take decades to achieve all of the remedial objectives. Therefore, it would not address groundwater ARARs in a reasonable amount of time. Since soils would not be directly addressed, exposure pathways from volatilization and direct contact would not be addressed. For these reasons, the alternative was rejected.

Detailed Analysis:

The deletion of three remedial alternatives from further consideration left six for the detailed analysis. These are renumbered as follows:

I. No action + monitoring.

II. Sheet piling vertical barrier + dewatering + water treatment + soil excavation + off-site incineration + monitoring.

III. Partial soil excavation + on-site thermal desorption + monitoring.

IV. In-situ soil venting + monitoring.

V. Sheet piling vertical barrier + dewatering + water treatment + in-situ soil venting + monitoring.

VI. In-situ soil venting + groundwater extraction + air stripping + in-situ biodegradation + monitoring.

The goal of the detailed analysis, as defined by the NCP, is to evaluate each of the viable alternatives against each of the seven criteria given in Section VIII below (Summary of the Comparative Analysis of the Alternatives). These criteria are overall protection of human health and the environment, compliance with ARARs, short-term impacts and effectiveness, long-term effectiveness and permanence, reduction of toxicity, mobility, and volume, implementability, and cost.

The information below briefly describes each of the alternatives retained for the detailed analysis. Following the descriptions is a discussion that compares the alternatives with respect to each of the criteria. It should be noted that the costs and implementation times given are initial estimates, and include the time needed to design the alternative. The present worth values below estimate how much money is needed today to finance projects that will take place over several years. The present worth of each alternative has been calculated based on the time to implement that particular alternative and assuming an interest rate of 10%.

Alternative I: No Action + monitoring.

Capital Cost: $0	Annual O&M: $80,000
Present Worth: $755,000	Time to Implement: 30 years

In accordance with the NCP, this alternative assumes no direct action at the site other than monitoring site conditions, in this case groundwater monitoring. Contaminants would continue to discharge into the harbor and volatilize from soils. The annual operation and maintenance costs (O&M) are for groundwater monitoring and fence maintenance.

<u>Alternative II</u>: Sheet piling vertical barrier + dewatering + water treatment + soil excavation + off-site incineration + monitoring.

Capital Cost: $238,880,000 Annual O&M: $1,090,000
Present worth: $242,931,000* Time to Implement: 6 years

To make it possible to lower the site water table and expose all of the significantly contaminated soils, sheet piling would be installed around the site. Because there is no shallow impermeable barrier (e.g., clay or rock) to seat the sheet wall, dewatering would induce salt water from the harbor into the site. It is estimated that to expose 15 feet of soil would require extracting 1.44 million gallons per day of fresh and brackish water. A total of 2.3 billion gallons would be treated and discharged. All of the contaminated soils would be excavated (approximately 105,000 cubic yards) and transported off-site for incineration.

* The present worth values calculated for alternatives II & III are different than those presented in the Feasibility Study. In the Feasibility Study, capital costs were discounted over the time to implement. It is not EPA policy to discount the capital costs.

<u>Alternative III</u>: Partial soil excavation + on-site thermal desorption + monitoring.

Capital Cost: $10,045,000 Annual O&M: $80,000
Present Worth: $10,321,000* Time to Implement: 2.5 years

Contaminated soils would be excavated down to three feet below the water table (approximately 34,000 cubic yards), treated in an on-site thermal desorption unit, and placed back into the ground. Deeper contaminated soils and groundwater would not be addressed. Off-gases from the thermal desorption unit would be treated in an afterburner to prevent unacceptable emissions of volatile organic compounds. A 30-year monitoring period is included.

<u>Alternative IV</u>: In-situ venting + monitoring.

Capital Cost: $1,230,000 Annual O&M $440,000 +
Present Worth: $1,977,000 Time to Implement: 2.5 years

This alternative would remove volatile contaminants from soils above the water table by an in-situ vacuum extraction technique. This entails a series of extraction wells and trenches around the site connected by piping to a vacuum system. The exhaust from the system would be treated (e.g., catalytic oxidation) to prevent unacceptable emissions. Saturated soils and groundwater would not be addressed.

<u>Alternative V</u>: Sheet piling vertical barrier + dewatering + water treatment

+ in-situ soil venting + monitoring.

Capital Cost: $8,650,000 Annual O&M: $1,550,000 +
Present Worth: $11,399,000 Time to Implement: 3 years

This alternative is similar to Alternative II except that soils are treated in-situ rather than excavated and transported off-site for incineration. Both soils and groundwater are addressed thereby removing the source of contamination to the other media of concern; sediments, surface water, and air. The soil venting process would be the same as in Alternative IV except that the dewatering would allow venting to 15 feet below the existing water table instead of to the water table.

Alternative VI: In-situ venting + groundwater extraction + air stripping + in-situ biodegradation + monitoring.

Capital Cost: $2,390,000 Annual O&M $970,000 +
Present Worth: $4,507,000 Time to Implement: 4 years

Both saturated and unsaturated soils would be treated along with groundwater under this alternative. Rather than dewatering the significantly contaminated soils entirely as with Alternatives II and V, the water table would be depressed approximately three feet by a combination of pumping and covering portions of the site with a synthetic material to reduce the infiltration of precipitation. Volatile contaminants would be removed from the unsaturated soils and treated to prevent release to the atmosphere.

A series of extraction wells would intercept contaminated groundwater before it discharges to Hempstead Harbor and Mott's Cove. The collected water (approximately 10-30 gallons per minute) would be treated in an air stripping tower. Air emissions would also be controlled by catalytic oxidation or an equivalent process. Treated water would be fortified with nutrients and an oxygen source before being reinjected into the site. This will stimulate the growth of naturally occurring bacteria capable of degrading site contaminants. This will enhance the remediation of the groundwater and will also address contaminated saturated soils.

VIII. SUMMARY OF THE COMPARATIVE ANALYSIS OF THE ALTERNATIVES

The remedial alternative proposed for the site by the NYSDEC and the USEPA was developed in accordance with the New York State Environmental Conservation Law (ECL) and is consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 USC Section 9601, et. seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). The criteria used in evaluating the potential remedial alternatives can be summarized as follows:

Threshold Criteria - The first two criteria must be satisfied in order for an alternative to be eligible for selection.

1. Protection of Human Health and the Environment--This criterion is an overall and final evaluation of the health and environmental impacts to assess whether each alternative is protective. This evaluation is based

upon a composite of factors assessed under other criteria, especially short/long-term effectiveness and compliance with ARARs/SCGs (see below).

2. Compliance with Applicable or Relevant and Appropriate New York State and Federal Requirements (ARARs)--ARARs are divided into the categories of chemical-specific (e.g. groundwater standards), action-specific (e.g. design of a landfill), and location-specific (e.g. protection of wetlands). To distinguish between state and federal requirements, New York State refers to its ARARs as Standards, Criteria, and Guidelines (SCGs). Certain policies and guidance that do not have the status of ARARs/SCGs that are considered to be important to the remedy selection process are identified as To-Be-Considered (TBC) criteria. A compilation of federal and state ARARs/SCGs/TBCs are included in Tables 4 and 5. At this site, groundwater is contaminated to levels above New York State standards thereby contributing to the need for site remediation. Table 6 indicates the locations and concentrations where groundwater concentrations exceed standards. Table 7 summarizes the comparison of the remedial alternatives with identified ARARs/SCGs/TBCs.

Primary Balancing Criteria - The next five "primary balancing criteria" are to be used to weigh major trade-offs among the different hazardous waste management strategies.

3. Short-term Impacts and Effectiveness--The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment is evaluated. The length of time needed to achieve the remedial objectives is estimated and compared with other alternatives.

4. Long-term Effectiveness and Permanence--If wastes or residuals will remain at the site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude and nature of the risk presented by the remaining wastes; 2) the adequacy of the controls intended to limit the risk to protective levels; and 3) the reliability of these controls.

5. Reduction of Toxicity, Mobility, or Volume--Preference is given to alternatives that permanently and by treatment significantly reduce the toxicity, mobility, or volume of the wastes at the site. This includes assessing the fate of the residues generated from treating the wastes at the site.

6. Implementability--The technical and administrative feasibility of implementing the alternative is evaluated. Technically, this includes the difficulties associated with the construction and operation of the alternative, the reliability of the technology, and the ability to effectively monitor the effectiveness of the remedy. Administratively, the availability of the necessary personnel and materiel is evaluated along with potential difficulties in obtaining special permits, rights-of-way for construction, etc.

7. Cost--Capital and operation and maintenance costs are estimated for the alternatives and compared on a present worth basis. Although cost is the last criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be

used as the basis for final selection.

Modifying Criteria - These final criteria are taken into account after evaluation of those above. They are focused upon after public comments have been received.

8. Community Acceptance--Concerns of the community regarding the RI/FS Reports and the Proposed Remedial Action Plan are evaluated. The Responsiveness Summary (Exhibit D) for this project identifies those concerns and presents the agencies responses to those concerns.

9. State Acceptance--In this case, New York State is the "lead agency" for the project and the USEPA is the "support agency." Therefore, "State acceptance" is understood to refer to the concurrence between the agencies on the proposed remedy.

The site specific goals for remediating this site can be summarized in general as follows:

1. Soil - a. Reduce the concentrations of benzene and methylene chloride so that the presence of these chemicals at the site do not present an added risk of cancer of more than one in one million under the most conservative exposure scenario.

   b. Reduce the concentrations of organic contaminants in soils so that, to the extent feasible, contaminants do not leach from soils and contaminate groundwater to levels above standards.

2. Groundwater - Reduce the concentrations of contaminants in groundwater to below NYS groundwater standards, to the extent technically feasible.

3. Sediments - Indirectly remediate sediments by treating the source of contaminants to the sediments, site soils and groundwater.

4. Air - Eliminate the exceedances of ambient air standards over the mudflats.

5. Surface Water - Eliminate the sheen on surface waters to comply with applicable surface water standards.

The following section addresses the alternatives that have been evaluated to achieve these goals.

As discussed above, the NCP requires that when evaluating potential remedial alternatives, the threshold criteria of overall protectiveness of human health and the environment along with compliance with Applicable or Relevant and Appropriate Requirements (ARARs) must be met. The five primary balancing criteria are then used to weigh trade-offs between the alternatives.

Overall Protection of Human Health and the Environment

Alternative II achieves the highest degree of protection by virtue of removing virtually all of the source of the contamination in the soils and groundwater. If implemented, Alternative II would allow unrestricted use of the site. This assumes that the PAH contamination in the sediments would be reduced to background levels in less than two years. This is considered to be a reasonable assumption given the moderate level of sediment contamination.

Alternatives III and IV provide a much lower degree of protectiveness because they do not address contaminated saturated soils or groundwater. Significant exposure pathways would remain depending upon the degree of contaminant removal obtained.

Alternatives V and VI approach a high degree of protection by removing a high percentage of contaminants in the soils and groundwater. Alternative V is judged to be somewhat more protective based upon the likely higher degree of removal afforded by vacuum extraction versus biotreatment. Alternative V would entail lowering the site water table by approximately 15 feet and then extracting contaminants under vacuum.

The No-Action alternative (Alt. I) would not be protective because the only contaminant removal process available would be natural attenuation. It would take decades to reduce the concentrations to acceptable levels.

<u>Compliance with ARARs</u>

The most significant of the ARARs at the site is the New York State groundwater standards. State regulations define the best usage of groundwater as a source of drinking water. Therefore, the assigned standards are stringent. Alternatives II, V, and VI include provisions for directly addressing groundwater contamination and are capable of achieving this ARAR. They also address soil contamination as a source of contaminants to the groundwater by leaching. Alternatives I, III, and IV rely upon natural attenuation. Alternatives III and IV include the removal of chemicals in the unsaturated zone that contribute to groundwater contamination. Alternatives I, III, and IV do not comply with this chemical-specific ARAR.

All alternatives substantially comply with the action-specific and location specific ARARs except in one case. The New York State Coastal Zone Management Program includes an overall goal of encouraging the restoration of waterfront areas for beneficial and compatible uses. The No-Action alternative would not be in compliance with this goal and Alternatives III and IV would be in marginal compliance.

Currently, there are no ARARs for contaminated sediments, but the State of New York has developed guidance values for evaluating sediment contamination. The concentration of several contaminants in sediments at the site somewhat exceed these guidance values. Alternatives II, V, and VI would indirectly clean up sediments by eliminating the source of contamination and allowing the contaminants to naturally degrade. Because of the difficulties associated with directly remediating sediments, and the habitat disruptions it would cause, indirect remediation is considered preferable in this case. A monitoring program will be required to ensure that the sediment contamination does naturally degrade.

The NCP specifies conditions under which a selected alternative may result in a remedy that does not attain one or more ARARs (40 CFR 300.430(f)(1)(ii)(C)). These waivers take into account factors such as technical impracticability and alternate approaches while ensuring that protection of human health and the environment is maintained.

Short-Term Impacts and Effectiveness

Alternatives IV, V, and VI are capable of achieving the remedial goals in a fairly short period of time while minimizing impacts to the community. This results from employing in-situ techniques with little disturbance of the site. Short-term environmental impacts could be created by dewatering the site (Alt. II and V) resulting in salt water intrusion. The short-term effectiveness of Alternative IV would be low because it does not address saturated soil and groundwater contamination and possible impacts to the tidal wetlands. Air pollution control equipment would minimize atmospheric impacts.

Alternatives II and III involve significant soil excavations which would expose heavily contaminated soils. Controlling the emissions of vapors and contaminated particulate would be difficult but could be done using engineering controls. Transportation of excavated soil (Alt. II) would also present some risk of impacts.

Alternative I would have no short-term effectiveness and existing impacts would continue.

Long-Term Effectiveness and Permanence

Alternatives III and IV would leave significant quantities of contaminants behind and rely upon natural flushing of the aquifer to complete the remediation. As with Alternative I, the problem would not become worse with time but would take many years to rectify itself. Alternatives II, V, and VI would significantly (or completely) remove contaminants from the site irreversibly.

Reduction of Toxicity, Mobility, and Volume by Treatment

Alternatives II, V, and VI substantially remove contaminants from the site. Alternatives III and IV would remove the majority of contaminants but would leave the saturated soils and groundwater untreated. Alternatives III through VI satisfy the preference of on-site treatment over off-site treatment. Alternative I contains no provisions for treatment.

All alternatives rely upon volume reduction rather than altering toxicity or reducing mobility by containment techniques. All of the treatment methods are irreversible.

Implementability

Alternative II is the least implementable. Difficulties include: installing and maintaining a 1.3 million gallon per day water treatment system; maintaining a constant water drawdown over a long period of time; off-site incinerator capacity limitations; minimizing fugitive emissions; and the logistics of high volume (approx. 7,000 trips) truck traffic.

Alternatives III and V would encounter some of the same difficulties but to a lesser degree. The feasibility of the biotreatment component of Alternative VI is based on bench scale tests. The applicability of this technology will be investigated by performing more extensive pilot tests before full scale implementation. Other concerns regarding technical/administrative feasibility and the availability of equipment and personnel are considered manageable.

Cost

The present worth of the No-Action alternative (I) is $755,000. This provides for 30 years of monitoring and maintenance. The cost of Alternative II would be extremely high ($242,931,000) due to the excavation, transport, and incineration of large amounts of contaminated soil and the treatment of large amounts of collected water. The costs for excavation and thermal treatment account for the relatively high cost of Alternative III ($10,321,000) even though it contains no provisions for treatment of groundwater or saturated soils. Alternative IV would accomplish nearly as much as Alternative III but at a much lower cost ($1,977,000). Alternatives V and VI would likely achieve similar levels of remediation but differ significantly in cost ($11,399,000 vs. $4,507,000 respectively). This is explained by the more aggressive dewatering/venting approach of Alternative V. Alternative VI relies upon the passive method of bioremediation to address saturated soils and, in part, groundwater. The following list summarizes the cost estimates.

Estimated Present Worth of Costs of Alternatives

Alt. I	No action	$755,000
Alt. II	Dewatering/Excavation/Off-site Incineration	$242,931,000
Alt. III	Partial Excavation/Thermal Desorption	$10,321,000
Alt. IV	Soil Venting	$1,977,000
Alt. V	Dewatering/Soil Venting	$11,399,000
Alt. VI	Soil Venting/Groundwater Extraction/Biodegradation	$4,507,000

IX. SELECTED REMEDY

Based upon the results of the Remedial Investigation and Feasibility Study (RI/FS), and the criteria for selecting a remedy under the applicable laws and regulations, the NYSDEC and USEPA have selected Alternative VI (In-Situ Soil Venting + Extraction of Groundwater + Air Stripping + In-Situ Biodegradation + Monitoring) to remediate the site. The estimated present worth and capital costs for the remedy are, respectively, $4,507,000 and $2,390,000. The costs to operate and maintain the remedy vary from year to year.

The elements of the proposed remedial program (Alternative VI: In-situ venting + extraction of groundwater + air stripping + in-situ biodegradation + monitoring) are as following (see Figure 5):

1. **A biotreatability pilot** study to determine the type and amount of nutrient and oxygen additives needed to stimulate the growth of indigenous bacteria capable of biodegrading site contaminants.

2. A **remedial design program** to verify the components of the conceptual design and provide the details necessary for the construction, implementation, and monitoring of the remedial program.

3. Installation and operation of a **soil venting (vapor extraction)** system consisting of:

   a. installation of a cover system on the ground surface over the area to be vented to prevent short-circuiting of air into the venting system and reduce the infiltration of precipitation into site soils;

   b. installation of an adequate number of vacuum extraction wells and trenches to remove contaminants from the soils in accordance with the remedial goals;

   c. piping, pumps, and other appurtenances to extract contaminated vapors from the treatment zone; and

   d. **air pollution controls** to limit air emissions to levels acceptable to the NYSDEC and USEPA.

4. Installation and operation of a **groundwater collection and treatment system** consisting of:

   a. collection wells, points, or trenches capable of intercepting contaminated groundwater before entering Hempstead Harbor or Mott's Cove;

   b. collection wells under the existing tank farm to collect contaminated groundwater;

   c. pipes, pumps, and other appurtenances to collect groundwater to a treatment area;

   d. treatment of groundwater by air stripping (or equivalent process) to levels acceptable to the NYSDEC and USEPA;

   e. **air pollution controls** to limit air emissions to levels acceptable to the NYSDEC and USEPA; and

   f. reinjection/infiltration of treated water fortified with nutrients and an oxygen source to stimulate the biotreatment of contaminated saturated soils and groundwater.

5. A **biotreatment program** designed to reduce to the extent practicable in conjunction with the other process options employed, contaminants in the saturated soils and groundwater.

6. A **monitoring program** designed to evaluate the performance of the remedial program while in operation and evaluate its continued effectiveness after discontinuation.

The performance standards to be obtained by implementing the remedy include the following:

1. Soil - a. Reduce the concentrations of benzene and methylene chloride so that the presence of these chemicals at the site do not present an added risk of cancer of more than one in one million under the most conservative exposure scenario.

   b. Reduce the concentrations of organic contaminants in soils so that, to the extent feasible, contaminants do not leach from soils and contaminate groundwater to levels above standards.

2. Groundwater - Reduce the concentrations of contaminants in groundwater to below NYS groundwater standards, to the extent technically feasible.

3. Sediments - Indirectly remediate sediments by treating the source of contaminants to the sediments, site soils and groundwater.

4. Air - Eliminate the exceedances of ambient air standards over the mudflats.

5. Surface Water - Eliminate the sheen on surface waters to comply with applicable surface water standards.

If monitoring indicates that continued operation of the remedy is not producing significant reductions in the concentrations of contaminants in soils and groundwater, in accordance with the NCP, the NYSDEC and the USEPA will evaluate whether discontinuance of the remedy is warranted. The criteria for discontinuation will include an evaluation of the operating conditions and parameters as well as a statistical determination that the remedy has attained the feasible limit of contaminant reduction and that further reductions would be impracticable.

X. STATUTORY DETERMINATIONS

The following discussion describes how the remedy complies with the decision criteria in the laws and regulations.

1. Protection of Human Health and the Environment

The proposed remedy is protective in that it would substantially remove from the site the contaminants that are the source of the threat to human health and the environment. Contaminants in the unsaturated soils would be removed by in-situ vacuum extraction techniques and controlled to prevent adverse air emissions. Saturated soils would be treated by in-situ biodegradation and by virtue of treating groundwater. Groundwater would be treated by extraction and air stripping as well as biodegradation. Treating these media will remove the source of contamination from the sediments, surface water, and air. No unacceptable short-term risks or cross-media impacts will be caused by implementation of the remedy.

2. Compliance with ARARs

Alternative VI, within a reasonable degree of certainty, complies with all applicable or relevant and appropriate federal and state requirements. The actual efficiency of the biotreatment program, the exchange of contaminants between soils and groundwater, the possibility of an off-site contributor, and the hydrogeologic complexities of the site contribute uncertainty to the ability of the remedy to attain compliance with all ARARs, primarily, New York State groundwater standards (6 NYCRR Part 703). However, the evaluation of the primary balancing criteria indicates that Alternative VI provides the best method for achieving the remedial goals because it minimizes short-term risk, is highly implementable, and is cost effective.

The remedy will continue to be operated and improved as necessary until such time that compliance with all ARARs has been obtained or conditions indicate that a waiver of the ARAR is justified based upon conditions given in the NCP.

3. Cost-Effectiveness

Of the alternatives that can achieve the remedial goals and meet the threshold evaluation criteria, Alternative VI has the lowest cost.

4. Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable.

The NYSDEC and the USEPA have determined that the selected remedy provides the best balance of tradeoffs among the alternatives for remediating the site. Of the alternatives that met the threshold criteria of "overall protection of human health and the environment" and "compliance with ARARs," the balancing criteria of "short-term impacts and effectiveness," "implementability," and "cost" were the most critical criteria for selecting a remedy. The remaining alternatives were comparable in their ability to meet the remaining criteria ("long-term effectiveness and permanence", and "reduction of toxicity, mobility, or volume").

Alternative VI avoids the short-term impacts associated with dewatering the site (Alts. II & V) and with the incineration of large quantities of contaminated soils (Alt. II). Dewatering the site could adversely affect the tidal wetlands in the vicinity. Incineration would present risks from exposure to vapors from excavated soils, transportation, and emissions from the treatment process.

The excavation and incineration of large quantities of soil and the collection and treatment of large amounts of groundwater pose technical and administrative feasibility difficulties for Alternative II. Although these difficulties could be overcome, the techniques associated with Alternative VI avoid those difficulties making it more promising.

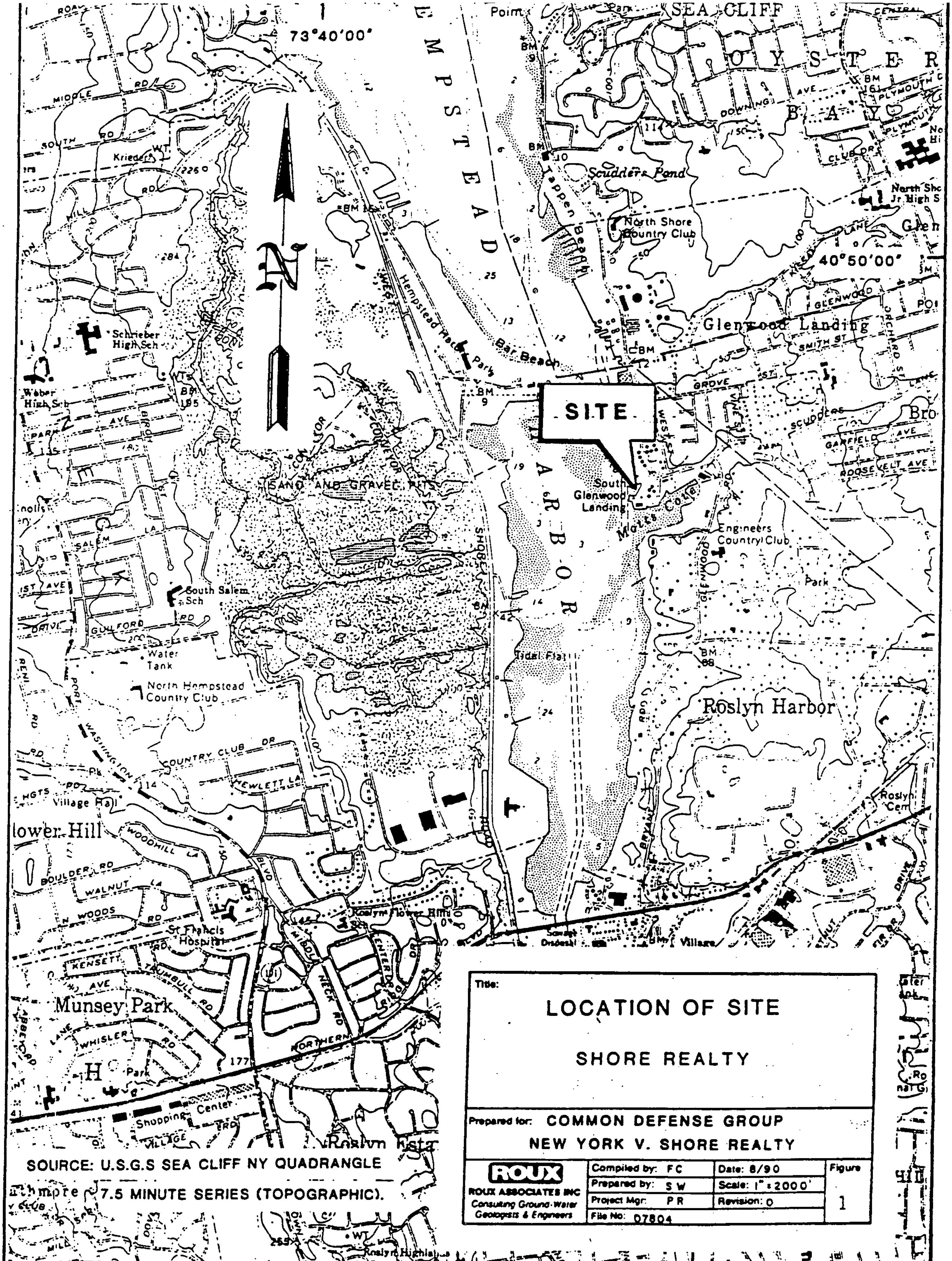
Alternatives II and V are approximately 50 and three times more costly, respectively, than Alternative VI and do not present beneficial qualities significantly greater than Alternative VI.

Alternative VI will provide a permanent solution by virtue of its ability to remove and destroy site contaminants rather than simply attempting to contain them. The primary technologies employed (in-situ vacuum extraction and biotreatment) are considered alternative treatment technologies. Therefore, the selected remedy utilizes permanent solutions and treatment technologies to the maximum extent practicable.

5. Preference for Treatment as Principal Elements

The principal threat is posed by contaminated soils, and the contaminants that leach from the soils to the groundwater. As discussed above, treatment rather than containment or disposal, is the principal element of the remedy for the principal threat. Furthermore, the proposed treatment program is an in-situ method which will minimize disturbance of the site and the surrounding community.

FIGURES



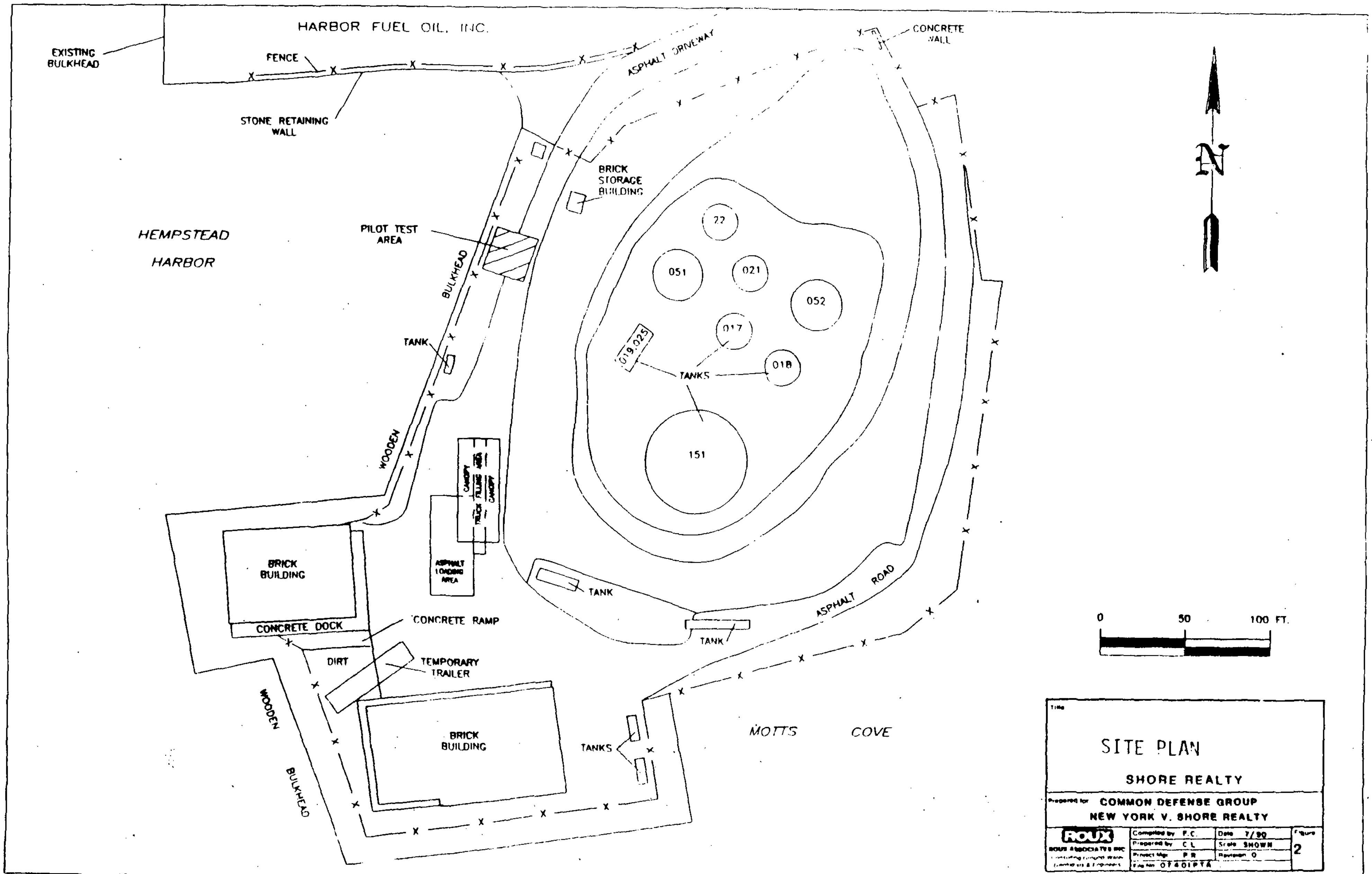
Title:

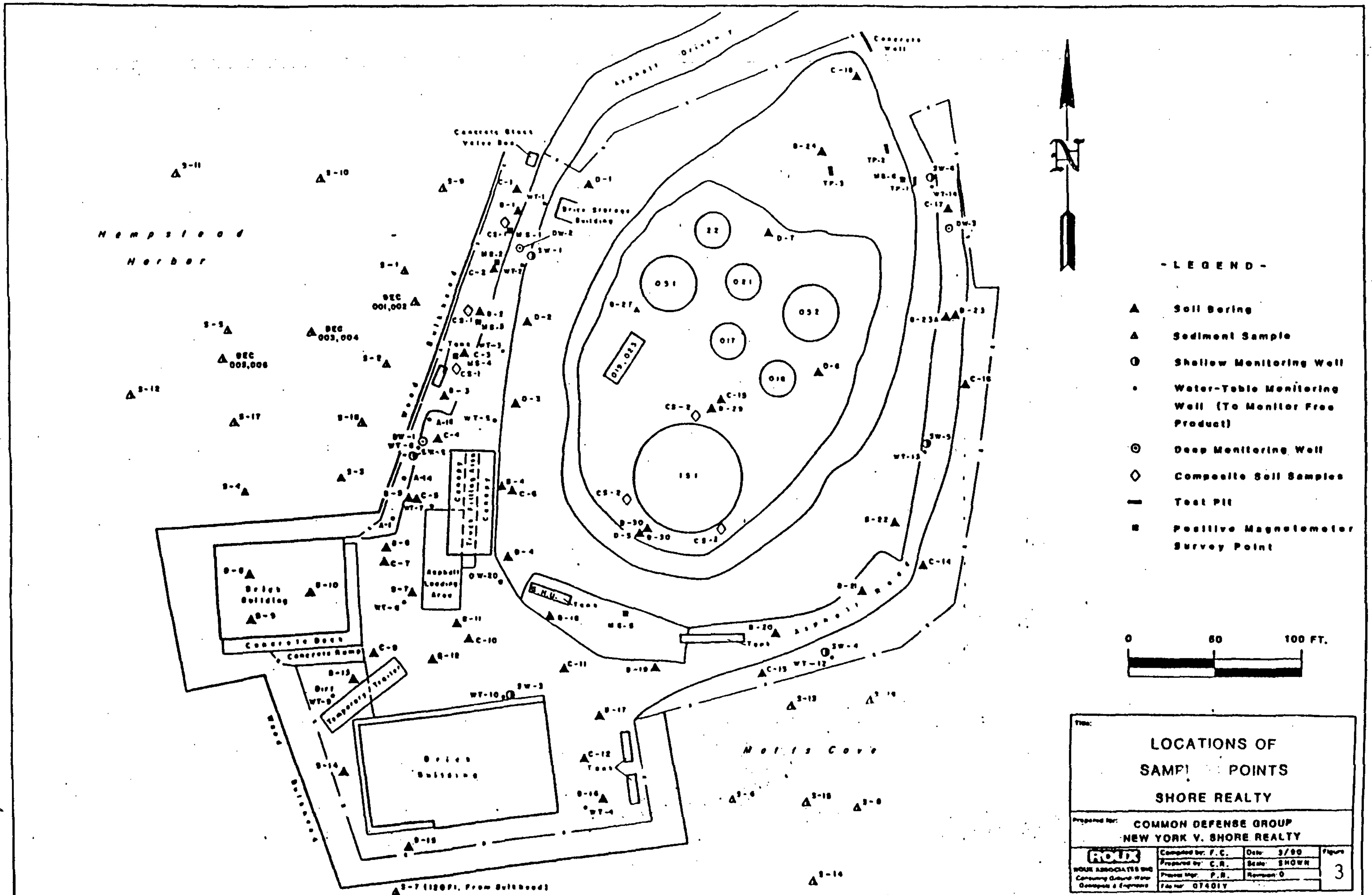
LOCATION OF SITE

SHORE REALTY

Prepared for: COMMON DEFENSE GROUP
NEW YORK V. SHORE REALTY

ROUX ASSOCIATES INC Consulting Ground-Water Geologists & Engineers	Compiled by: FC	Date: 8/90	Figure
	Prepared by: SW	Scale: 1" = 2000'	1
	Project Mgr: PR	Revision: 0	
	File No: 07804		


HARBOR FUEL OIL, INC.
EXISTING BULKHEAD
FENCE
STONE RETAINING WALL
ASPHALT DRIVEWAY
CONCRETE WALL
BRICK STORAGE BUILDING
PILOT TEST AREA
HEMPSTEAD HARBOR
BULKHEAD
WOODEN
TANK
22
051
021
052
017
019,025
018
TANKS
151
CANOPY
TRUCK FILLING AREA
ASPHALT LOADING AREA
BRICK BUILDING
CONCRETE DOCK
CONCRETE RAMP
DIRT
TEMPORARY TRAILER
BRICK BUILDING
WOODEN
BULKHEAD
TANKS
TANK
TANK
ASPHALT ROAD
MOTTS COVE
N
0
50
100 FT.
SITE PLAN
SHORE REALTY
COMMON DEFENSE GROUP
NEW YORK V. SHORE REALTY
ROUX
ROUX ASSOCIATES INC
Compiled by F.C.
Prepared by C.L.
Project Mgr P.R.
Date 7/90
Scale SHOWN
Revision 0
Figure 2



Hempstead Harbor
Mott's Cove
N
- LEGEND -
Soil Boring
Sediment Sample
Shallow Monitoring Well
Water-Table Monitoring Well (To Monitor Free Product)
Deep Monitoring Well
Composite Soil Samples
Test Pit
Positive Magnetometer Survey Point
0
50
100 FT.
Brick Building
Concrete Dock
Concrete Ramp
Temporary Trailer
Concrete Block Valve Box
Brick Storage Building
Asphalt Loading Area
Concrete Wall
LOCATIONS OF
SAMPL POINTS
SHORE REALTY
COMMON DEFENSE GROUP
NEW YORK V. SHORE REALTY
Compiled by: F.C.
Prepared by: C.R.
Date: 3/90
Scale: SHOWN
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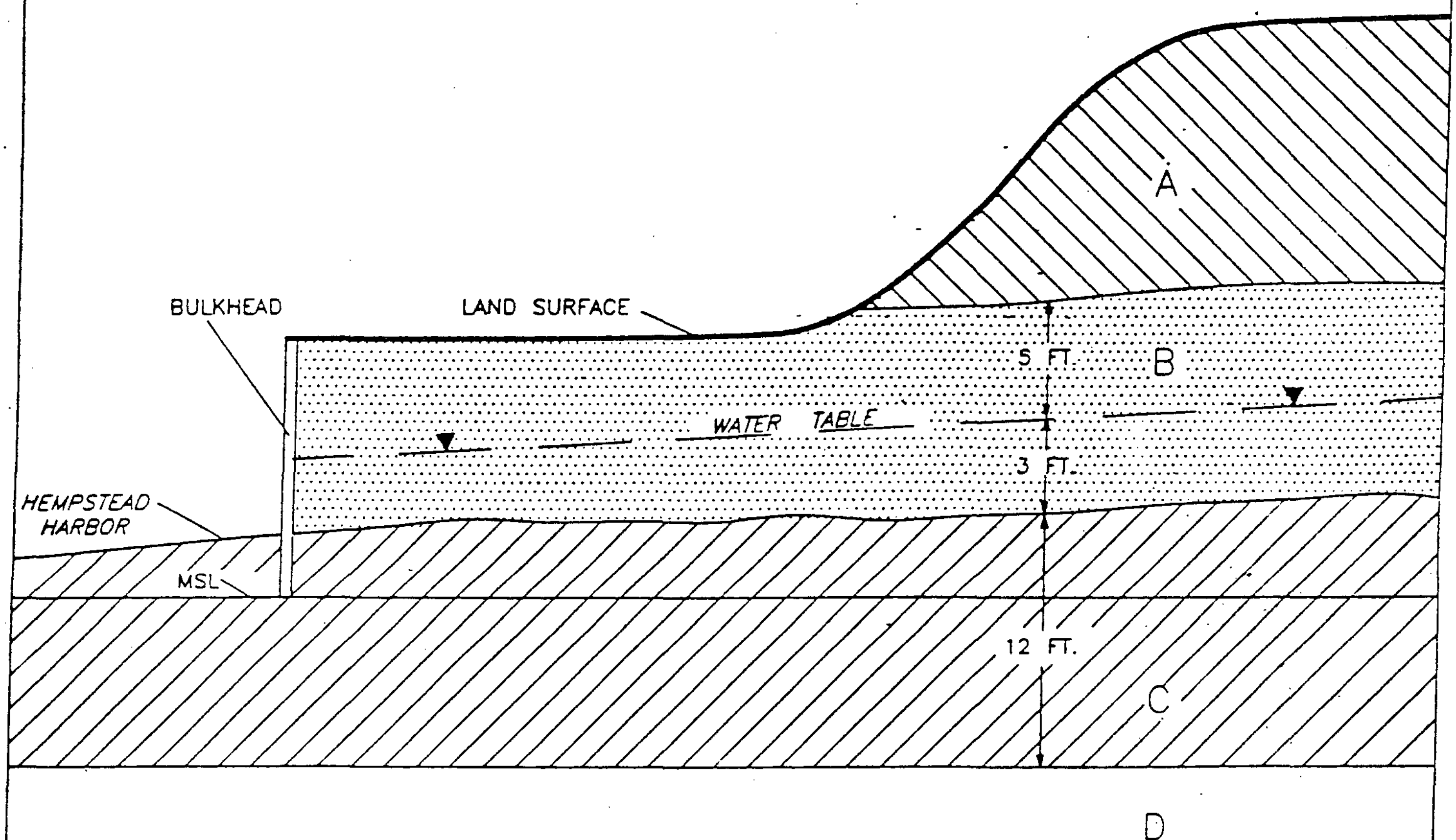


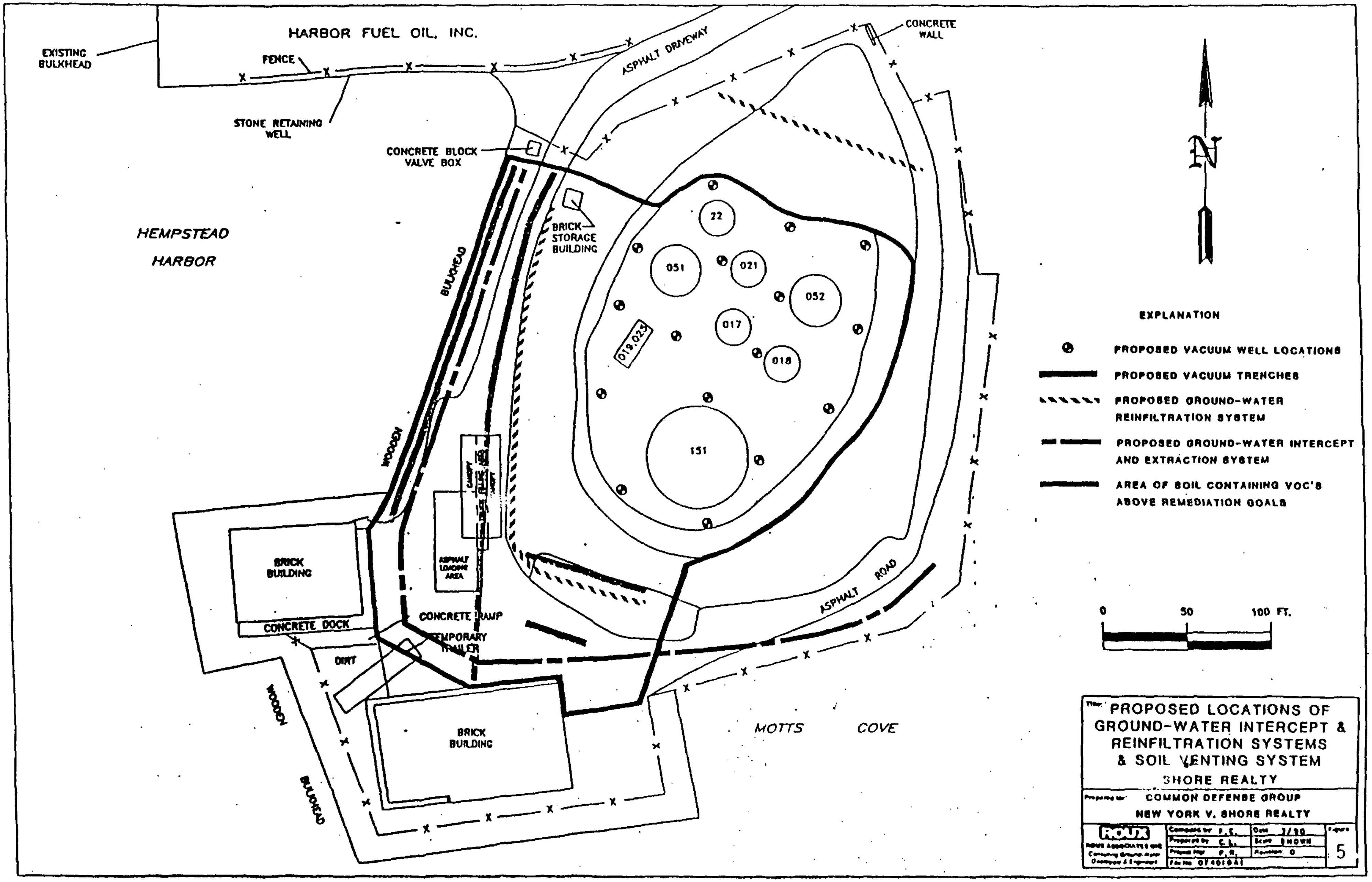
Title:

SOIL HORIZONS USED TO MAP THE EXTENT OF CONTAMINATION AT THE SHORE REALTY SITE

Prepared For: COMMON DEFENSE GROUP
NEW YORK V. SHORE REALTY

ROUX ASSOCIATES INC
Consulting Ground-Water Geologists & Engineers

Compiled by: L.W.	Date: 1/91	FIGURE
Prepared by: C.L.	Scale: NONE	4
Project Mgr: P.R.	Revision: 0	
File No: 07401SHU		


HARBOR FUEL OIL, INC.
EXISTING BULKHEAD
FENCE
STONE RETAINING WELL
CONCRETE BLOCK VALVE BOX
ASPHALT DRIVEWAY
CONCRETE WALL
HEMPSTEAD HARBOR
BRICK STORAGE BUILDING
BULKHEAD
WOODEN
22
051
021
052
017
018
019,025
151
BRICK BUILDING
CONCRETE DOCK
CONCRETE RAMP
TEMPORARY TRAILER
ASPHALT LOADING AREA
DIRT
WOODEN
BULKHEAD
BRICK BUILDING
ASPHALT ROAD
MOTTS COVE
N
EXPLANATION
PROPOSED VACUUM WELL LOCATIONS
PROPOSED VACUUM TRENCHES
PROPOSED GROUND-WATER REINFILTRATION SYSTEM
PROPOSED GROUND-WATER INTERCEPT AND EXTRACTION SYSTEM
AREA OF SOIL CONTAINING VOC'S ABOVE REMEDIATION GOALS
0
50
100 FT.
PROPOSED LOCATIONS OF GROUND-WATER INTERCEPT & REINFILTRATION SYSTEMS & SOIL VENTING SYSTEM
SHORE REALTY
COMMON DEFENSE GROUP
NEW YORK V. SHORE REALTY
ROUX
Date 7/90
Scale SHOWN
Revision 0
5

TABLES

Table 1
Summary of Site Conditions
(all values are approximate)

Area of Site:	3.2 acres
Area to Remediate:	1.4 acres
Average Depth to Water:	8 feet
Soil Type:	sand
Surface Water:	borders Hempstead Harbor
Contaminated Media:	soil, groundwater, surface water, sediments, air

The following table lists representative contaminants found at the site and indicates the maximum concentration of that contaminant found in various media. The Remedial Investigation Report (See Exhibit A) contains a full description of the nature and extent of the contamination at the site.

Representative Contaminants
Maximum Concentration Detected by Media (ppb)

Contaminant	Soil	Groundwater	Sediments	Air
ethylbenzene	1,300,000	5,600	150	0.36
toluene	2,600,000	350,000	13	0.84
xylenes	8,400,000	45,000	1,400	-
benzene	5	270	-	1.00
tetrachloroethene	4	430	3	-
1,1,1-trichloroethene	7,600	11	-	-
naphthalene	12,000	40	60	-
benzo(b)fluoranthene	140	-	810	-
bis(2-ethylhexyl)phthalate	12,000	20	8,100	-
lead	83,000	639	140,000	-

Table 2 Estimated Baseline Incremental Lifetime Cancer Risks (ILCR) and Hazard Indices (HI) for Exposure to Chemicals Identified at the Shore Realty Site -- Residential Use

Chemical	Soil Concentration in ppm (mg/kg) (a,b)	Estimated Vapor Concentration (mg/m^3) (c)	Estimated Lifetime Average Daily Intake (mg/day): Inhalation (d)	Estimated Lifetime Average Daily Intake (mg/day): Dermal Absorption (e)	Estimated Lifetime Average Daily Intake (mg/day): Ingestion (f)	Estimated Lifetime Average Daily Intake - All Pathways (mg/kg/day) (g)	CPF (h)	RfD (i)	Estimated Potential ILCR (j)	Estimated HI (k)
Ethylbenzene	1.3E+3	2.24E-02	5.65E-01	7.05E-02	1.18E-01	1.08E-02	noncarc.	1.00E-01	–	1.08E-01
Toluene	2.6E+3	1.35E-01	3.39E+00	1.41E-01	2.35E-01	5.38E-02	noncarc.	3.00E-01	–	1.79E-01
Xylene	8.4E+3	1.07E-01	2.71E+00	4.56E-01	7.60E-01	5.60E-02	noncarc.	2.00E+00	–	2.80E-02
Methylene chloride	2.0E+1	1.66E-02	4.19E-01	1.09E-03	1.81E-03	6.03E-03	1.50E-02	6.00E-02	9.05E-05	1.01E-01
TCA	7.6E+0	2.09E-05	5.27E-04	4.12E-04	6.87E-04	2.32E-05	noncarc.	9.00E-02	–	2.58E-04
Benzene	3.7E+0	8.40E-04	2.12E-02	2.01E-04	3.35E-04	3.10E-04	2.90E-02	carcinogen	8.99E-06	–
Bis(2-ethylhexyl)phthalate (l)	1.2E+1	6.72E-07	1.69E-05	6.51E-04	1.09E-03	2.50E-05	1.40E-02	2.00E-02	3.51E-07	1.25E-03
Naphthalene (l,m)	2.5E+1	1.40E-06	3.53E-05	1.36E-03	2.26E-03	5.22E-05	noncarc.	3.40E-02	–	1.53E-03
Benzo(a)pyrene equivalents (l,n)	7.8E-2	4.36E-09	1.10E-07	4.23E-06	7.04E-06	1.63E-07	1.15E+01	carcinogen	1.87E-06	–
Lead (l)	8.3E+1	4.65E-06	1.17E-04	4.50E-03	7.50E-03	1.73E-04	noncarc.	1.40E-03	–	1.24E-01

Notes:

a Maximum level of compound detected in site-related soils (SC)
b Because of possible analytical masking effects of high levels of ETX the mean analytical detection limit is used for benzene (see text for more detail)
c Estimated ambient vapor (VC) for arbitary soil chemical concentrations of 1E+4 mg/kg (see Tables 3-5 and 3-6) and factored for maximum levels detected. Note that a vapor component from the tidal flats is included where appropriate and that for bis(2-ethylhexyl)phthalate, naphthalene, B(a)P equivalents and lead the air concentrations are based on PM10 for fugitive dust.
d Estimated average daily intake via inhalation = (VC * RV * HD * PF * DE * EY) / (DY * LT)
e Estimated average daily intake via dermal absorption = (SC * SA * CA * A * F * AF * DE * EY) / (DY * LT)
f Estimated average daily intake via ingestion = (SC * SA * CA * IF * A * F * GF * DE * EY) / (DY * LT)
g Sum of intake by three pathways of exposure divided by average body weight
h Carcinogenic potency factors used are for inhalation and are derived from IRIS (USEPA, 1990a) and SPHEM (USEPA, 1986a)
i Reference doses for chronic exposure (RfDs) were derived from IRIS (USEPA, 1990a) and SPHEM (1986a)
j Incremental lifetime cancer risk = CPF (mg/kg/day)^-1 * Lifetime average daily intake (mg/kg/day)
k Hazard index = Lifetime average daily intake (mg/kg/day) / RfD (mg/kg/day)
l Inhalation exposure is based on exposure to fugitive dust at levels equivalent to PM10 for New York (USEPA, 1990c)
m Naphthalene and methyl naphthalene concentrations are combined; the RfD is estimated using New York State AGC for naphthalene (NYS, 1990) because there is no USEPA RfD
n Benzo(a)pyrene equivalents represent the carcinogenic PAHs expressed in terms of the estimated potency of B(a)P (Table 3-3)

Assumptions Used for Estimating Daily Intake

Respiratory volume (m^3/hr) (RV) =	1.4	Conversion factor (kg/mg) (F) =	1E-6	Pulmonary retention factor (PF) =	0.75
Body weight (kg) (BW) =	70	Hours exposed/day (hours/day) (HD) =	24	Skin absorption factor (AF) =	0.06
Height (cm) (Ht) =	165	Days exposed per year (days/year) (DE) =	365	Ingestion factor (IF) =	0.1
Body surface area (cm^2) (SA) =	18083	Total days per year (days/year) (DY) =	365	Gastrointestinal absorption factor (GF) =	1.0
Contact area (CA) =	0.1	Exposure Years (years) (EY) =	70	Particulate matter (ug/m^3) (pm10) =	56
Soil adherance (mg/cm^2) (A) =	0.5	Lifetime (years) (LT) =	70		

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Table 3. INITIAL SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS

RESPONSE MEDIA	GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTIONS	DESCRIPTION	SCREENING
Soil	No Action	None	Not Applicable	No Action	Required for consideration by NCP
	Containment	Capping	Synthetic	Geotextile and low permeability geomembrane fabric overlain by topsoil in areas of soil contamination exceeding remediation goals.	Potentially applicable
			Asphalt	Spray application of layer of asphalt over areas of soil contamination exceeding remediation goals.	Potentially applicable
			Layered	Clay and Synthetic membrane covered by soil over areas of soil contamination exceeding remediation goals.	Potentially applicable
		Vertical Barriers	Sheet Piling	Steel interlocking piles driven by a pneumatic pile driver to act as a ground-water barrier.	Potentially applicable
			Slurry Wall	A trench excavated through or under a slurry of bentonite clay (to an impervious layer) to allow for water-table depression.	Potentially applicable
	Removal	Excavation	Excavation	Removal of contaminated soil exceeding remediation goals.	Potentially applicable
	Treatment of Excavated Soil	Solidification/ Stabilization	Cement Based	Contaminated soil would be mixed with cement to form a hardened, rock-like mass.	Not effective, organic constituents not immobilized (U.S EPA, 1985; Chemwaste)
			Silicate Based (Pozzolanic)	Consists of reacting lime with fine-grained siliceous materials and mixing with contaminated soil.	Not effective, volatile organic constituents not chemically immobilized (Chemfix)
			Thermoplastic	Involves sealing contaminated soil in an asphalt bitumen matrix.	Not effective, xylene and toluene diffuse rapidly through asphalt (U.S. EPA, 1985)
		Biological Treatment	Aerobic (Land farming)	Degradation of organics using microorganisms in an aerobic environment.	Not applicable as there is insufficient level land and treatment zone is less then 3 feet above seasonal high water level.
			Anaerobic	Degradation of organics using microorganisms in an anaerobic environment.	Not applicable to specific organic contaminants at Site

Table 3 INITIAL SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS

RESPONSE MEDIA	GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTIONS	DESCRIPTION	SCREENING
Soil (cont)		Thermal Treatment (Off-site)	Rotary Kiln	Combustion in horizontally rotating cylinder designed for uniform heat transfer.	Potentially applicable
			Circulating Fluidized Bed	Waste injected into hot agitated bed of sand where combustion occurs; waste may require some pretreatment.	Potentially applicable
			Multiple Hearth	Waste injected into a vertical cylinder containing a series of solid, flat hearths. Solid waste often requires pretreatment methods.	Potentially applicable
			Pyrolysis	Thermal conversion of organic material into solid, liquid and gaseous components in an oxygen deficient atmosphere.	Not applicable; wastes must contain pure organics
		Thermal Treatment (On-site)	Mobile Incineration	Use of mobile incinerator (Rotary Kiln or circulating fluidized bed) for on-site incineration.	Potentially applicable
			Thermal Desorption	Involves the volatilization of VOCs in soil without achieving soil combustion temperatures. VOCs are stripped without destroying the soil.	Potentially applicable
	Disposal	On-site	RCRA Landfill	Involves the construction of an on-site RCRA landfill for disposal of contaminated soil. Future site use restricted	Not applicable, existing site structures and shallow water-table depth prohibit the construction of RCRA landfill
		Off-site	Off-site Disposal	Disposal of contaminated soil at off-site RCRA licensed disposal facility. Soil may require treatment prior to disposal due to landban restrictions.	Potentially applicable

Table 3 INITIAL SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS

RESPONSE MEDIA	GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTIONS	DESCRIPTION	SCREENING
Soil (cont)	In-Situ Treatment	Physical Treatment	Soil Venting	Involves the removal of volatilized organic constituents by volatilization from contaminated soil via a series of extraction vents in the unsaturated soil	Potentially applicable
		Biological	Biodegration	Treatment of contaminated soil via microbial degradation of constituents. Water, an oxygen source, and nutrients infiltrated into the area of contaminated soil. Contaminants are biodegraded and ground water is pumped to surface for recirculation to soil or discharge.	Potentially applicable
		Chemical Treatment	Oxidation	Transformation, degradation, and/or immobilization of organic constituents via the removal of electrons or addition of oxygen to the atoms. Potential for formation of more toxic or mobile compounds. Limited available data.	Not applicable
			Reduction	Oxidation state of compounds reduced by the addition of electrons to the atom. Effectiveness of chemical reduction of organics in soil not well demonstrated (U.S. EPA, 1985a).	Not applicable
			Hydrolysis	Involves the displacement of a functional group on an organic molecule with a hydroxyl group from water. Potential for formation of toxic byproducts. Not effective for constituents present at site (U.S. EPA, 1987a).	Not applicable
Water	No Action	None	Not Applicable	No Action	Required for consideration by NCP
	Containment	Capping	Synthetic	Geotextile and low permeability geomembrane fabric overlain by topsoil in areas of soil contamination exceeding remedial goals.	Potentially applicable
			Asphalt	Spray application of layer of asphalt over areas of soil contamination exceeding remedial goals.	Potentially applicable
			Layered	Clay and synthetic membrane covered by soil over areas of soil exceeding remediation goals.	Potentially applicable
		Vertical barriers	Slurry walls	A trench excavated through or under a slurry of bentonite clay (to an impervious layer) to shut off ground-water flow.	Not effective; would not prevent ground-water movement into Hempstead Harbor
			Sheet piling	Wood, precast concrete or steel interlocking piles driven by a pneumatic pile driver to act as a ground-water barrier.	Not effective; would not prevent ground-water movement into Hempstead Harbor
	Extraction	Ground-Water Collection/Pumping Technology	Extraction Wells	Pumps out contaminated ground water.	Potentially Applicable

RESPONSE MEDIA	GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTIONS	DESCRIPTION	SCREENING
Water (cont)			Extraction/Injection Wells	Removes and recirculates a portion of removed ground water through the source area to promote contaminant removal.	Potentially applicable
	Treatment	Biological	Aerobic	Degradation of organics using microorganisms in an aerobic environment.	Potentially applicable
		Physical	Oil-Water Separation	Uses mechanical separators to remove oil thus facilitating further treatment for dissolved contaminants.	Not effective
			Air Stripping	Removes volatile organic compounds by blowing a stream of air up through the downward cascading ground water in a packed vertical cylindrical tower.	Potentially applicable
			Carbon Adsorption	Utilizes activated carbon granules in a series of packed bed vertical tanks to remove contaminants.	Potentially applicable
		Chemical	Precipitation/ Flocculation	Mixing of lime with flocculating against to precipitate metals.	Not effective; too specific
			Neutralization	Adjusts pH of treated water stream prior to discharge or treatment by other processes.	Potentially applicable
			Ion Exchange	Uses ion-exchange resins to remove halides, metals sulfates, nitrates and cyanides.	Not effective; presence of solids interferes with operation.
			Oxidation	Degradation of organic compounds through chemical reactions with oxidants.	Potentially applicable
			Chemical Reduction	Uses a reducing agent to form a less toxic compound.	Not effective; too specialized.
		In-Situ	Bioreclamation	Promotes microbial activity (addition of oxygen source and nutrients) to degrade organic constituents.	Potentially applicable
			Air Stripping (soil vapor extraction)	Promotes volatilization of organic constituents on the water table.	Potentially applicable
			Chemical treatment	Described in soil options	Not effective for contaminants at Site
	Disposal	Off-Site	Discharge to POTW	Effective, may require pretreatment prior to discharge.	Potentially applicable
			Discharge to Surface-Water Body	Requires pretreatment to prevent contravention of surface-water standards and guidance values.	Potentially applicable
	Disposal	On-Site	Reinfiltration	Uses injection wells or unfiltered trenches.	Potentially applicable

Table 4 Listing of Potential Federal ARARs & TBCs

WATER

Safe Drinking Water Act (42 U.S.C. 300(f))

40 CFR 141.11-16	Maximum Contaminant Levels
40 CFR 141.50-52	Maximum Contaminant Level Goals
40 CFR 144-147	Underground Injection Control Regulations
40 CFR 122-125	National Pollutant Discharge Elimination System
40 CFR 403	Pretreatment Standards

Clean Water Act (33 U.S.C. 1251)

40 CFR 230	Guidelines for Specification of Disposal Sites for Dredged or Fill Materials
40 CFR 231	Restriction of Disposal Sites for Dredged Materials
40 CFR 131	Water Quality Criteria

Rivers and Harbors Act

Section 10	Dredge and Fill Requirements

"Quality Criteria for Water, 1986" - EPA 44/5-86-001, May 1, 1986, 51 FR 43665

Health Advisories, EPA Office of Water

"Developing Requirements for Direct and Indirect Discharge of CERCLA Wastewaters, 1987" - USEPA Office of Water Guidance Documents

AIR

Clean Air Act (42 U.S.C. 7401)

40 CFR 50	National Primary and Secondary Ambient Air Quality Standards
40 CFR 61	National Emissions Standards for Hazardous Air Pollutants
40 CFR 60	New Source Performance Standards

HAZARDOUS WASTE

Resource Conservation and Recovery Act

40 CFR 264	Identification and Listing of Hazardous Wastes
40 CFR 264.18	Location Standards and Prohibitions for TSD Facilities
40 CFR 264.90 - 109	Ground-water Protection and Monitoring
40 CFR 264.110-120	Closure and Post-closure
40 CFR 264.170-176	Containers
40 CFR 264.190-199	Tanks
40 CFR 264.270-299	Land Treatment
40 CFR 264.300-339	Landfills
40 CFR 264.340-999	Incinerators
40 CFR 268.1 - 50	Land Disposal Restrictions
40 CFR 264 Subpart S	Corrective Action at Hazardous Waste Mangement Facilities (Proposed)

USEPA RCRA Guidance Documents - Design Guidelines

Land Treatment Units

Landfill Design

USEPA Technical Resource Documents

Hazardous Waste Land Treatment

Review of In-Place Treatment Techniques for Contaminated Surface Soils, Vol 2, USEPA-540/2-84-0036, November, 1984

Department of Transportation

49 CFR 107, 171, 172	Hazardous Materials Transport

Toxic Substances Control Act (15 U.S.C. 2601)

40 CFR 761.60-79	Storage and Disposal of PCBs
40 CFR 761.120	PCB Spill Clean-up Policy Rule

MISCELLANEOUS

Coastal Zone Management Act of 1972 (16 U.S.C. 1451)

15 CFR 930, 923.45	Air and Water Pollution Control Requirements

Endangered Species Act of 1973 (16 U.S.C. 1531)

50 CFR 81, 225, 402

Fish and Wildlife Coordination Act (16 U.S.C. 661)

Marine Protection, Research and Sanctuaries Act (33 U.S.C. 1401)

Occupational Safety and Health Act (29 U.S.C. 651)

29 CFR 1910	Requirements for Workers Engaged in Response Activities

Integrated Risk Information System (IRIS), USEPA, 1990

Carcinogenic Potency Factors (CPF)

Reference Doses for Chronic Exposure (RfD)

Health Effects Assessments (HEAs), USEPA, 1985

Executive Orders 11988 (Floodplains) and 11990 (Wetlands)

USEPA's Policy on Floodplains and Wetlands Assessment for CERCLA Actions, August 6, 1985 (40 CFR 6, Appendix A)

Table 5 Listing of Potential New York State ARARs/SCGs and TBCs

WATER	
6 NYCRR 701	Classifications and Standards of Quality and Purity, and Appendix 31
6 NYCRR 701.15	Derivation of Effluent Limitations; empowers State to enforce guidance values for surface water where no standards exist
6 NYCRR 702	Special Classifications and Standards
6 NYCRR 703	Ground-water Classifications, Quality Standards and Effluent Standards and/or Limitations
6 NYCRR 750-757	Implementation of NPDES Program in NYS
6 NYCRR 885	Classifies Hempstead Harbor Class SB Waters
10 NYCRR 5	Public Water Supply MCLs
10 NYCRR 170	Water Supply Sources
TOGS 1.1.1. (9/25/90)	Ambient Water Quality Standards and Guidance Values
TOGS 2.1.2 (4/1/88)	Underground Injection/Recirculation (UIR) at Ground-Water Remediation Sites

AIR	
6 NYCRR 257	Air Quality Standards
6 NYCRR 212	General Process Emission Sources

Air Clean-up Criterion, January 1990, Ambient Guideline Concentrations

HAZARDOUS WASTE	
6 NYCRR 371	Identification and Listing of Hazardous Waste
6 NYCRR 372	Hazardous Waste Manifest System and Related Standards

Table 5 **Listing of Potential New York State ARARs/SCGs and TBCs**

HAZARDOUS WASTE (Continued)	
6 NYCRR 373	Location and Design Standards for TSD Facilities
6 NYCRR 373-2	Final Status Standards for Owners and Operators of Hazardous Waste Treatment/Storage/Disposal Facilities
6 NYCRR 374	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
6 NYCRR 360	Sewage Sludge Destined for Land Application

MISCELLANEOUS	
Department of State Coastal Management Program	
State Coastal Policies	
Division of Marine Resource	
6 NYCRR 661	Chapter 10 Tidal Wetlands, Land Use Regulations
Division of Fish and Wildlife	
6 NYCRR 182	Endangered Species of Fish and Wildlife
Sediment Criteria (NYS 1989)	

Table 6 **Sample Locations and Concentrations Detected in Ground Water Above Ground-Water ARARs - ppb**

CAS Number	Compound	10NYCRR5-1 MCL Unless Otherwise Noted	Concentrations Detected Above ARARs (ppb)-Jan 1990 Unless Otherwise Noted* [a]	
VOLATILE ORGANICS				
75-01-4	Vinyl Chloride	2	12	WT-10 (1987)
75-09-2	Methylene Chloride	5	110	WT-2
			860	WT-3
			970	WT-6
67-64-1	Acetone	50	170	WT-2
			2,000	WT-3
			590	WT-6
75-34-3	1,1-Dichloroethane	5	11	WT-7(1987)
			6	WT-10(1987)
540-59-0	1,2-Dichloroethene (total)	10	25	WT-7(1987)
			31	WT-10(1987)
			77	WT-14
71-55-6	1,1,1-Trichloroethane	5	6	WT-7(1987)
			7	WT-10(1987)
			6	SW-6
79-01-6	Trichloroethene	5	29	WT-7(1987)
			23	WT-10(1987)
			12	WT-14
			9	SW-1
71-43-2	Benzene	5	18	WT-2
			36	WT-5
			180	WT-6
			6	WT-10(1987)
127-18-4	Tetrachloroethene	5	430	WT-10(1987)
			7	WT-13
			49	WT-14
			22	SW-1
108-88-3	Toluene	5	19,000	WT-2
			50,000	WT-3
			330	WT-5
			270,000	WT-6
			350	WT-10(1987)
100-41-4	Ethylbenzene	5	5,400	WT-2
			2,700	WT-3
			160	WT-5
			4,200	WT-6
1330-20-7	Xylenes (total)	15	28,000	WT-2
			18,000	WT-3
			5,800	WT-5
			25,000	WT-6
			830	WT-7(1987)
			450	WT-10(1987)

Table 6 **Sample Locations and Concentrations Detected in Ground Water Above Ground-Water ARARs - ppb**

CAS Number	Compound	10NYCRR5-1 MCL Unless Otherwise Noted	Concentrations Detected Above ARARs (ppb)-Ja 1990 Unless Otherwise Noted (a)	
SEMI-VOLATILE ORGANICS				
105-67-9	2,4-Dimethylphenol	50	390	WT-2
			230	WT-3
			120	WT-5
65-85-0	Benzoic Acid	50	120	WT-3
84-74-2	Di-n-butylphthalate	50	110	WT-2
			72	WT-3
			70	WT-5
			73	WT-12
			73	SW-1
INORGANICS				
7440-38-2	Arsenic	25(1)	27	WT-3
			29	WT-5
7440-43-9	Cadmium	10	55	WT-2
			68	WT-12
			13	SW-13
7440-47-3	Chromium	50	57	WT-2
7439-89-6	Iron	300*	70,900	WT-2
			76,200	WT-3
			50,300	WT-5
			39,100	WT-6
			1,840	WT-12
			458	WT-13
			414	DW-1
			520	SW-1
			347	SW-4
			644	SW-6
7439-92-1	Lead	25(1)	631	WT-2
			187	WT-5
			639	WT-12
			278	SW-3
7439-96-5	Manganese	300*	1,690	WT-2
			2,690	WT-3
			753	WT-5
			1,770	WT-6
			41	WT-12
			56	WT-13
7440-66-6	Zinc	300(2)	612	WT-2
			418	WT-5
			581	WT-12
			485	SW-3

(a) Latest sampling results - 1987 data presented for wells not resampled in 1990.
(1) 6NYCRR 703 Standard
(2) 10NYCRR 170 Standard
* Total of iron and manganese = 500 ppb

Table 7 **Individual Evaluation of Final Alternatives**

Criteria	Alternative 1 No Action/Monitoring	Alternative 2 Sheet Piling Wall/ Dewater/Water Treatment/Excavation/ Off-Site Incineration	Alternative 3 Excavation/Thermal Description/Monitoring	Alternative 4 In-Situ Soil Venting/Monitoring	Alternative 5 Sheet Piling Wall/ Dewatering/Water Treatment/In-Situ Soil Venting/Monitoring	Alternative 6 In-Situ Soil Venting/ Extraction of Ground Water/Air Stripping/In-Situ Biodegradation/ Monitoring
Overall Protectiveness						
Human Health Protection-Direct Contact/Soil Ingestion	No significant reduction in risk. Fencing deters unauthorized Site access	Reduces direct contact/ soil ingestion risk	Reduces direct contact/ soil ingestion risk	Reduces direct contact/soil ingestion risk	Reduces direct contact/ soil ingestion risk	Reduces direct contact/ soil ingestion risk
Environmental Protection	Allows continued leaching into water table. Biodegradation & volatilization would result in reduction over time	Prevents contaminants migrating into Hempstead Harbor. Installation of sheet piling may have damaging effect on marine organisms	Contamination is curtailed from the treated soil. Below the excavation level leaching may continue which will require monitoring.	Inhibits contaminants from migrating to Hempstead Harbor with ground water	Prevents contaminants migrating into Hempstead Harbor. Installation of sheet piling and dewatering may have damaging effect on marine organisms	Prevents contaminants from reaching Hempstead Harbor.
Compliance with ARARs/SCGs						
Chemical-Specific						
Risk Assessment VOC Soil Cleanup Goals (Table 4-1)	Will not meet goals	Will meet goals	Will meet goals	Will meet goals	Will meet goals	Will meet goals
10 NYCRR 5.1 MCL Standards Used as Ground-water Goals (Table 4-4)	Will not meet goals	Will meet goals	Will not meet goals (except over long period)	Will not meet goals (except over long period)	May not meet goals quickly	May not meet goals quickly
Surface-Water Standards/TBCs (Table 4-6)	Will not meet goals	Will meet goals	Will not meet goals	Will meet goals	Will meet goals	Will meet goals
Div. of Air Resources AGC Guidelines used as Air Emissions Goals over mud flats and from soils (Table 4-8)	Will not meet goals	Will meet goals	Will meet goals	Will meet goals	Will meet goals	Will meet goals

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Table 7 Individual Evaluation of Final Alternatives

Criteria	Alternative 1 No Action/Monitoring	Alternative 2 Sheet Piling Wall/ Dewater/Water Treatment/Excavation/ Off-Site Incineration	Alternative 3 Excavation/Thermal Description/Monitoring	Alternative 4 In-Situ Soil Venting/Monitoring	Alternative 5 Sheet Piling Wall/ Dewatering/Water Treatment/In-Situ Soil Venting/Monitoring	Alternative 6 In-Situ Soil Venting/ Extraction of Ground Water/Air Stripping/In-Situ Biodegradation/ Monitoring
Sediment TBCs Standards/TCBs (Table 4-7)	Will not meet goals	Will meet goals	Will meet goals	Will meet goals	Will meet goals	Will meet goals
Location-Specific						
State Coastal Policies	Will not comply	Will comply	Will comply	Will meet goals	Will comply	Will comply
Action-Specific						
Standards for Hazardous Waste Facility (Design)						
6NYCRR373	Does not apply	Does not apply	Does not apply	Does not apply	Does not apply	
6NYCRR257	Does not apply	Does not apply	Will meet standards	Will meet standards	Will meet standards	Will meet standards
6NYCRR212	Does not apply	Does not apply	Will meet standards	Will meet standards	Will meet standards	Will meet standards
6NYCRR371	Does not apply	Will meet standards	Does not apply	Does not apply	Does not apply	Will meet standards
6NYCRR372	Does not apply	Will meet standards	Does not apply	Does not apply	Does not apply	Does not apply
DOT 49CFR 107, 171	Does not apply	Will meet standards	Does not apply	Does not apply	Does not apply	Does not apply
OSHA 29 CFR 1910	Does not apply	Will meet standards	Will meet standards	Will comply	Will meet standards	Will meet standards
NYS TOG 2.12 (4/1/88)	Does not apply	Does not apply	Does not apply	Does not apply	Does not apply	Will meet goals
<u>Long-Term Effectiveness & Permanence</u>						
Magnitude of residual risk - Direct Contact/ Soil Ingestion	Fencing deters unauthorized site access potential for direct contact with soils	Risk is eliminated	Risk is eliminated	Risk is eliminated	Risk is eliminated	Risk eliminated
Adequacy & Reliability of Controls	None	Reliability is high because all contaminants are removed	Reliability moderate, partial remediation	Reliability is moderate, well proven technology, partial remediation	Reliability moderate due to difficult maintenance of dewatering	Reliability is high due to multiple proven treatment technologies

Table 7 **Individual Evaluation of Final Alternatives**

Criteria	Alternative 1 No Action/Monitoring	Alternative 2 Sheet Piling Wall/ Dewater/Water Treatment/Excavation/ Off-Site Incineration	Alternative 3 Excavation/Thermal Description/Monitoring	Alternative 4 In-Situ Soil Venting/Monitoring	Alternative 5 Sheet Piling Wall/ Dewatering/Water Treatment/In-Situ Soil Venting/Monitoring	Alternative 6 In-Situ Soil Venting/ Extraction of Ground Water/Air Stripping/In-Situ Biodegradation/ Monitoring
Need for five year Review.	Review would be required to ensure adequate protection of human health & the environment is maintained.	None required (at least five years to complete)	Ground-water monitoring results must be reviewed.	Ground-water monitoring results must be reviewed	Ground-water monitoring results must be reviewed	Ground-water monitoring results must be reviewed
Reduction of Toxicity, Mobility or Volume Through Treatment						
Treatment Process Used	None	Air stripping/ incineration	Thermal desorption	In-situ soil venting	Air stripping/in-situ soil venting	In-situ soil venting, air stripping, in-situ biodegradation;
Amount Destroyed or Treated	None	99.9% of organics	99.9% volatiles in treated soils removed and destroyed	95% destruction	Removes and destroys 99% of volatile organic compounds	95% destruction
Reduction of Toxicity, Mobility or Volume	None	Permanent destruction	Permanent destruction	Permanent destruction.	Permanent destruction	Permanent destruction
Irreversible Treatment	None	Treatment is irreversible	Treatment is irreversible	Treatment is irreversible.	Treatment is irreversible	Treatment is irreversible
Type & Quality of Residuals Remaining After Treatment	--	No detectable residuals	Residuals in soils below the water table and ground water	Residuals in soils below the water table and ground water	Possible low levels of residuals	Possible low levels of residuals
Statutory Preference for On-site Treatment	Does not satisfy	Does not satisfy	Satisfies	Satisfies	Satisfies	Satisfies

Table 7 Individual Evaluation of Final Alternatives

Criteria	Alternative 1 No Action/Monitoring	Alternative 2 Sheet Piling Wall/ Dewater/Water Treatment/Excavation/ Off-Site Incineration	Alternative 3 Excavation/Thermal Description/Monitoring	Alternative 4 In-Situ Soil Venting/Monitoring	Alternative 5 Sheet Piling Wall/ Dewatering/Water Treatment/In-Situ Soil Venting/Monitoring	Alternative 6 In-Situ Soil Venting/ Extraction of Ground Water/Air Stripping/In-Situ Biodegradation/ Monitoring
Short-term Effectiveness						
Community Protection	No additional risk	Excavation would release dust and organic vapors to surrounding population; increase in heavy truck traffic and noise	Excavation and thermal desorption unit will release dust and organic vapors to surrounding population.	Minimum impact on community.	Minimum impact on community	Minimum impact on community
Worker Protection	No significant risk	Compliance with health and safety plan required.	Compliance with health & safety plan required.	Compliance with a health and safety plan.	Compliance with health & safety plan required.	Compliance with health & safety plan required.
Environmental Impacts	Continued impact from existing conditions for an undetermined number of years	Airborne particulates may affect surface-water quality, sheet piling walls and dewatering may affect marine organisms, salt water in aquifer	Airborne particulates may affect surface-water quality.	None	Sheet piling and dewatering may cause damage to local ecosystem	None
Time Until Action is Complete	Not applicable	6 years	1.5 years	1.5 years	2 years	3 years
Implementability						
Ability to Construct & Operate	No construction or operation	No room to stockpile excavated soil; therefore, excavation/truck loading will be simultaneous; sheet piling difficult due to absence of subsurface layer; no room for water treatment facility	Thermal desorption fairly easy to operate. Excavation may be difficult near water table	Readily available	Difficult to maintain dewatering process; sheet piling difficult due to absence of subsurface layer	Readily available
Ease of Doing More Action if Needed	If monitoring indicates more action is needed, FS/ROD may need to be repeated.	Can be expanded, but dewatering process will be difficult to maintain	Can handle varying volume & concentration. Depth limited by water table.	System cannot be expanded below water table.	System cannot be expanded.	System can be expanded.

Table 7 **Individual Evaluation of Final Alternatives**

Criteria	Alternative 1 No Action/Monitoring	Alternative 2 Sheet Piling Wall/ Dewater/Water Treatment/Excavation/ Off-Site Incineration	Alternative 3 Excavation/Thermal Description/Monitoring	Alternative 4 In-Situ Soil Venting/Monitoring	Alternative 5 Sheet Piling Wall/ Dewatering/Water Treatment/In-Situ Soil Venting/Monitoring	Alternative 6 In-Situ Soil Venting/ Extraction of Ground Water/Air Stripping/In-Situ Biodegradation/ Monitoring
Ability to Monitor Effectiveness	Not applicable	Difficult to monitor effectiveness until complete.	Ground-water monitoring will define effectiveness.	Ground-water monitoring will define effectiveness.	Difficult to monitor effectiveness until complete.	Ground-water monitoring will define effectiveness.
Ability to Obtain Approvals and Coordinate with Other Agencies	No approval necessary	Uncertain	Difficult to obtain	Readily available	Uncertain	Readily available
Availability of Services & Capabilities	No services or capacities required	Difficult to locate water-treatment system to handle the amount of water pumped; need more than one landfill for soil removed.	Need trained operators	Readily available	Difficult to locate water treatment system to handle required volume	Readily available
Availability of Equipment, Specialist and Materials	None required	No special equipment Difficulty in removing 2,300 mgd for dewatering. Restricted by limited off-site incinerator capacity.	Needs mobile thermal desorption unit and trained operators.	No specialist required Equipment and materials are readily available.	May be difficult to locate water treatment system for large volume of water.	No specialist required
Availability of Technologies	None required	Readily available	Well developed. May require pilot testing.	Readily available	Readily available	Readily available
Cost						
Capital Cost	-	$238,880,000	$10,045,000	$1,420,000	$ 9,000,000	$2,390,000
O & M Cost	$80,000. (30 years)	$ 1,090,000	$80,000	$ 550,000	$ 1,790,000	$ 970,000
Present Worth Cost	$55,000.	$187,351,000	$10,044,000	$2,312,000	$12,166,000	$4,507,000

EXHIBITS

EXHIBIT A
ADMINISTRATIVE RECORD
SHORE REALTY SITE (#130006)
AKA APPLIED ENVIRONMENTAL SERVICES SITE

A. Reports and Work Plans

1. "Feasibility Study: Shore Realty Site; Glenwood Landing, New York," prepared by Roux Associates, Inc., April 17, 1991.

2. "Remedial Investigation: Shore Realty Site; Glenwood Landing, New York," prepared by Roux Associates, Inc., April 16, 1991.

3. "Feasibility Study: Shore Realty Site; Glenwood Landin New York," prepared by Roux Associates, Inc., February 14, 1991.

4. "Remedial Investigation: Shore Realty Site; Glenwood Landing, New York," prepared by Roux Associates, Inc., February 1, 1991.

5. "Feasibility Study: Shore Realty Site; Glenwood Landing, New York," prepared by Roux Associates, Inc., September 1990.

6. "Remedial Investigation: Shore Realty Site; Glenwood Landing, New York," prepared by Roux Associates, Inc., August 1990.

7. "Supplemental Remedial Investigation: Shore Realty Site; Glenwood Landing, New York," prepared by Roux Associates, Inc., April 1990.

8. "Work Plan: Additional Investigations; Remedial Investigation/ Feasibility Study; Shore Realty Site; Glenwood Landing, New York," prepared by Roux Associates, Inc., October 2, 1989.

9. "Remedial Investigation: Shore Realty Site; Glenwood Landing, New York," prepared by Roux Associates, Inc., August 1988.

10. "Remedial Investigation: Shore Realty Site; Glenwood Landing, New York," prepared by Roux Associates, Inc., February 1988.

11. "Work Plan: Remedial Investigation and Feasibility Study; Shore Realty Site; Glenwood Landing, New York," prepared by Roux Associates, Inc., May 1987 (as Appendix B to Stipulation and Order in item A.12 below).

12. "Stipulation and Order, United States District Court, Eastern District of New York; The State of New York, Plaintiff, against, Shore Realty Corp., et al, Defendants," 84 Civ. 0864, signed September 16, 1987.

B. Government Comments on RI/FS Reports

1. Re: February 1991 RI/FS Reports; letter from G. Johnson (NYSDOL) to P. Paden (for PRPs), dated March 5, 1991.

2. Re: August/September 1990 RI/FS Reports; letter from G. Johnson (NYSDOL) to P. Paden (for PRPs), dated November 1, 1991.

3. Re: August/September 1990 RI/FS Reports; letter from J. Hangartner (USEPA) to A. English (NYSDEC), dated October 16, 1990.

4. Re: August 1988 RI Report and April 1990 Supplemental RI Report; letter from C. Petersen (USEPA) to A. English (NYSDEC), dated June 28, 1990.

5. Re: August 1988 RI Report and April 1990 Supplemental RI Report; letter from G. Johnson (NYSDOL) to P. Paden (for PRPs), dated June 21, 1990.

6. Re: Analytical Data; letter from T. Larson (NYSDEC) to P. Roux (Roux Associates), dated December 23, 1988.

7. Re: Analytical Data; letter from T. Larson (NYSDEC) to P. Roux (Roux Associates), dated October 4, 1988.

8. Re: February 1988 RI Report; letter from G. Johnson (NYSDOL) to P. Paden (for PRPs), dated May 2, 1988.

C. Environmental Reports and Guidance

1. "Sediment Criteria - December 1989: Used as guidance by the Bureau of Environmental Protection, Division of Fish and Wildlife, New York State Department of Environmental Conservation."

2. Claims of Natural Resource Damages - Letter to U.S. District Court Judge J.B. Weinstein from Assistant Attorneys General G.J. Johnson and S. Miller, New York State Department of Law, dated September 6, 1990.

3. "Assessment of the Impact of Leachate Upon Estuarine Biota: Applied Environmental Services Facility, Glenwood Landing, Hempstead Harbor," prepared by the Nassau County Department of Health, dated August 1987.

4. Department of Commerce Comments - received May 23, 1988.

D. Documentation of NYS Financed Removal Action:

1. Declaration of Imminent Danger - Letter from J.J. Dowling, Commissioner of the Nassau County Department of Health to NYSDEC Commissioner H.G. Williams, dated May 29, 1985.

2. "Findings of Fact and Determination: In the Matter of an Inactive Hazardous Waste Disposal Site Remediation Program for One Shore Road, Glenwood Landing, New York," signed by NYSDEC Commissioner H.G. Williams, dated May 31, 1985.

3. Memorandum from N.H. Nosenchuck, Director, Division of Solid and Hazardous Waste to NYSDEC Commissioner H.G. Williams, dated June 4, 1987.

4. Final Contractor's Application for Payment; from removal action contractor, Waste Conversion, Inc., endorsed April II, 1988.

5. From G. Johnson to D. Peirez (for Shore Realty), dated September 18,

1986.

E. Correspondence Regarding ARARs

1. From G. Johnson (NYSDOL) to P. Paden (for PRPs), dated July 12, 1990.

2. From B. Mullen (USEPA) to G. Johnson (NYSDOL), dated July 11, 1990.

3. From S. McCormick (NYSDEC) to J. Worrall (Roux Associates), dated May 18, 1990.

4. From G. Johnson (NYSDOL) to P. Paden (for PRPs), dated July 28, 1988.

5. From G. Johnson (NYSDOL) to P. Paden (for PRPs), dated July 13, 1988.

F. Correspondence Regarding Changes to the RI

1. Re: Soil Vapor Survey; letter from A. English (NYSDEC) to P. Roux (Roux Associates), dated June 22, 1990.

2. Re: Pilot Venting Study; letter from A. English (NYSDEC) to P. Roux (Roux Associates), dated April 23, 1990.

3. Re: Drilling Technique; letter from A. English (NYSDEC) to P. Roux (Roux Associates), dated November 29, 1989.

4. Re: Air Analyses; letter from A. English (NYSDEC) to P. Roux (Roux Associates), dated November 6, 1989.

5. Re: Agreement to Perform Supplemental RI; letter from P. Paden (for PRPs) to G. Johnson (NYSDOL), dated October 10, 1989.

G. Waste Analysis Reports

1. ERCO - March 1984.

2. SCA Services/Chemical Waste Mgmt. Co., ENRAC Div. - August 6, 1985.

3. Compuchem - August 8, 1985.

4. Waste Conversion - October 1985

5. ENSECO - March 24, 1986.

H. Public Participation Documents

1. Record of Decision: Applied Environmental Services Site; also known as the Shore Realty Site (#130006); June 1991.

2. Proposed Remedial Action Plan: Shore Realty Site; AKA Applied Environmental Services Site; April 1991.

3. Responsiveness Summary - Exhibit D of Record of Decision

4. Transcript of Public Meeting; North Shore High School, May 15, 1991.

5. Public Notice, Press Release, Invitation/Fact Sheet, and Agenda; for public meeting - North Shore High School, May 15, 1991.

6. Public Notice, Press Release, Invitation/Fact Sheet, and Agenda; public information information meeting - North Shore High School, September 18, 1990

7. Transcript of Public Meeting; North Shore High School, August 12, 1987.

8. Public Notice; Public Meeting, North Shore High School August 12, 1987.

9. Public Notice and Fact Sheet regarding February 1988 RI Report.

10. "Public Participation Work Plan for Shore Realty Site at Glenwood Landing," prepared by the New York State Department of Environmental Conservation.

EXHIBIT B

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF HAZARDOUS WASTE REMEDIATION
INACTIVE HAZARDOUS WASTE DISPOSAL REPORT

CLASSIFICATION CODE: 2 REGION: 1 SITE CODE: 130006
EPA ID: NYD980535652

NAME OF SITE : Shore Realty Company (AES)
STREET ADDRESS: One Shore Road

TOWN/CITY:	COUNTY:	ZIP:
Glenwood Landing	Nassau	11547

SITE TYPE: Open Dump- Structure-X Lagoon- Landfill- Treatment Pond-
ESTIMATED SIZE: 3 Acres

SITE OWNER/OPERATOR INFORMATION:
CURRENT OWNER NAME....: Shore Realty Inc.
CURRENT OWNER ADDRESS.: 1 Shore Rd., Glenwood Landing, NY
OWNER(S) DURING USE...: Mattiace
OPERATOR DURING USE...: Mattiace/ & Applied Env'l Service
OPERATOR ADDRESS......: Garvies Point Road, Glen Cove/ Glenwd Land
PERIOD ASSOCIATED WITH HAZARDOUS WASTE: From 1978 To 1984

SITE DESCRIPTION:
Shore Realty Company is owned by the Joseph Saleh and Ammon Bartur and operated by the Applied Environmental Services (AES). Prior to their occupancy, this site was leased and operated by Mattiace Petrochemicals. During the operation by Mattiace, several spills of petrochemicals and organics occured: including a overturned trailer containing a toluene like substance in October 1978. This substance was found seeping into Hempstead Harbor from the site. An opening was made level to depth of the groundwater and was dug parallel to the sea wall. A recovery pump, which removes floating products from the groundwater, was installed and approximately 500 gallons of hydrocarbons are eliminated each month. A series of monitoring wells approx. 15 ft deep was installed in the upgradient side of the opening.
In September 1980, an analysis of soil and groundwater samples indicated both to be contaminated with volatile halogenated hydrocarbons and volatile nonhalogenated hydrocarbons. As of April 1990, the trench recovery system was still in operation and contaminated soil has been removed from the site. However, contamination of the upper glacial aquifier and potential contamination of deeper confined aquifier is possible. Also there is potential for contamination of surface waters of Hempstead Harbor. Equally important is the fact that there are over 70,000 people who are served by groundwater taken from wells within 3 miles of the site, all which are potentially threatened by the confirmed contamination of the upper aquifier. Soil samples detected toluene(1953 ppb; xylene(9910 ppb). Water samples detected benzene; toluene; xylene.

HAZARDOUS WASTE DISPOSED: Confirmed-X Suspected-

TYPE	QUANTITY (units)
Toluene	
Xylene	3000 gallons
Ethyl Benzene	

SITE CODE: 130006

ANALYTICAL DATA AVAILABLE:
Air-X Surface Water-X Groundwater-X Soil-X Sediment-X

CONTRAVENTION OF STANDARDS:
Groundwater-X Drinking Water-X Surface Water- Air-

LEGAL ACTION:

TYPE..: Fed. Dist. Court State- X Federal-
STATUS: Negotiation in Progress- Order Signed- X

REMEDIAL ACTION:

Proposed- Under design- In Progress-X Completed-
NATURE OF ACTION: RI-FS

GEOTECHNICAL INFORMATION:
SOIL TYPE: 130008Fill
GROUNDWATER DEPTH: 10 feet

ASSESSMENT OF ENVIRONMENTAL PROBLEMS:

Groundwater, soil and sediment contamination - possible impact on surface water.

ASSESSMENT OF HEALTH PROBLEMS:

Based on the available information there are potential exposures to hazardous substances for residents adjacent to the site and for recreational users of Hempstead Harbor. Soil vapor monitoring on-site indicates vadose zone contamination throughout the site. Therefore the potential for soil vapor migration needs to be evaluated. Access to the site is restricted. However, contamination of Hempstead Harbor by active contaminant seeps from the bulkhead is occurring and exposure to contaminants by recreational users of the boat launching ramp adjacent to the bulkhead may occur. The RI/FS lacked sufficient data for assessing the potential exposures associated with this site. A supplemental investigation which called for the installation of another deep well in the northwest corner of the site and soil vapor testing to determine if soil vapor is migrating off-site was developed to address deficiencies in the investigation data.

EXHIBIT C
PROJECT MILESTONES
SHORE REALTY SITE (#130006)
AKA APPLIED ENVIRONMENTAL SERVICES SITE
(some dates approximate)

1939-1977	Site used for bulk storage of petroleum products.
1977-1980	Site leased to Mattiace Petrochemical Co. to store petrochemical products.
1978	Toluene spill.
1980-1983	Site leased to Applied Environmental Services (AES) and Hazardous Waste Disposal (HWD). Operated as hazardous waste storage and treatment facility.
10/83	Site purchased by Shore Realty Corp.
1/84	AES evicted from site
3/1/84	At request of NYS Attorney General, U.S. District Court orders Shore Realty to clean up site.
6/84-9/84	Shore Realty removes 255 of 410 drums containing hazardous wastes from the site then refuses to complete cleanup of remaining drums and tanks.
5/31/85	NYSDEC initiates procedures to complete cleanup at state expense.
9/13/85	After being held in contempt of court and fined, Shore Realty completes removal of drums of chemicals from site.
11/85-9/86	NYSDEC contractor performs surficial cleanup of site removing approximately 700,000 gallons of hazardous wastes at a cost of $3.1 million.
6/86	Site placed on federal National Priorities List.
8/12/87	Public Meeting - North Shore High School.
9/16/87	Court orders defendants to perform Remedial Investigation and Feasibility Study (RI/FS).
2/88	First draft of RI Report submitted to State.
3/88	Public notice of availability of RI Report.
5/88	State rejects RI Report.
8/88	Revised RI Report submitted.
10/88	Revised RI Report rejected.

10/88-1/89	Meetings and correspondence to develop work plan for additional site investigation work to complete RI. Work plan approved 10/10/89.
11/9/89	Field work for Supplemental RI begins.
4/90	Supplemental RI Report submitted.
6/90	Supplemental RI Report rejected.
8/90	RI Report resubmitted.
9/90	First draft of FS submitted.
9/18/90	Public Meeting - North Shore High School
11/1/90	RI/FS Reports rejected.
2/91	RI/FS Reports resubmitted.
3/5/91	RI/FS Reports rejected
4/17/91	RI/FS Reports resubmitted.
4/17/91	Public notice of availability of RI/FS Reports and public meeting to discuss proposed remedy.
5/15/91	Public meeting - North Shore High School.

EXHIBIT D
RESPONSIVENESS SUMMARY
PROPOSED REMEDIAL ACTION PLAN
SHORE REALTY SITE - ID NO. 130006
AKA APPLIED ENVIRONMENTAL SERVICES SITE

The issues addressed below were raised during a public meeting held on May 15, 1991 at the North Shore High School in Glen Head, New York. The purpose of the meeting was to present the Proposed Remedial Action Plan (PRAP) for the site and receive comments on the PRAP for consideration during the final selection of a remedy. The transcript from the meeting is included in the administrative record for the site which is open for public review. The public comment period on the PRAP extended from April 22, 1991 to May 24, 1991. The issues raised have been grouped into the following five categories.

I. Issues Regarding the Proposed Remedy

Issue #1: How is the feasibility of a proposed remedy defined and who makes the determination?

Response: Proposed remedies are evaluated against nine criteria given in the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP") to determine if they are feasible. The first two criteria, "protection of human health and the environment" and "compliance with applicable or relevant and appropriate New York State and federal requirements," are threshold criteria that must be satisfied for an alternative to be eligible for selection. The next five "primary balancing criteria" are used to compare major tradeoffs among the different remedial strategies. These five are "short-term impacts and effectiveness," "long-term effectiveness and permanence," "reduction of toxicity, mobility, and volume," "implementability," and "cost." The final two "modifying criteria" of "state acceptance" and "community acceptance" are evaluated after comments on the proposed remedy have been received. In this case, New York State is the "lead agency" for the project and the USEPA is the "support agency." Therefore, "State acceptance" is understood to refer to the concurrence between the agencies on the proposed remedy. These nine criteria are described in more detail in the PRAP and the Record of Decision (ROD).

As explained above, the NYSDEC and the USEPA are responsible for evaluating the feasibility of the proposed remedy in accordance with these nine criteria.

Issue #2: How long will it take to complete the remedial process?

Response: The Feasibility Study concludes that the active portion of the remedial program will take three years to complete . Adding one year for design of the system, the remedial process would take a total of four years. Given the uncertainties involved, it is quite possible that the remedy will take longer, perhaps five to seven years.

Issue #3: If cost were no object, would a different alternative have been proposed?

Response: The proposed alternative was judged to be the best selection after evaluating <u>all</u> of the governing criteria. In this case, the selection of the proposed alternative was not affected by the cost. In fact, the proposed alternative is significantly more expensive than some of the others considered, but it has the lowest cost of those that passed the threshold criteria.

Issue #4: Can we name three sites where the technologies that comprise the proposed remedy have been shown to work?

Response: Assessing the expected reliability of the remedy is best addressed by evaluating the components of the remedy. The main components are in-situ soil venting, groundwater extraction and treatment, and biotreatment. Soil venting has been demonstrated and evaluated as part of the EPA Superfund Innovative Technology Evaluation (SITE) Program, and has been effectively used at sites in Michigan, Puerto Rico, and Massachusetts. The technology has also been used extensively in the remediation of leaking underground petroleum storage tanks. The bulk of the contaminants at the Shore Realty site are volatile chemicals also found in petroleum products and are expected to respond well to venting.

Groundwater extraction and treatment is very common, but its effectiveness is controversial. Similar systems have been used at dozens of sites around the country, with varying effectiveness. The conditions at this site that favor the likely effectiveness of the groundwater treatment program are; (1) the relatively small size of the site; (2) the low density of the major contaminants and an upward hydraulic gradient that combine to keep contaminants at shallow depths and more accessible for treatment; (3) the characteristics of the soil (e.g. lack of large amounts of organic matter); and the amenability of the contaminants to treatment.

The component with the shortest "track record" in the remediation of sites is the biotreatment program. The technology has been studied extensively at the bench and pilot scale at sites around the country, and is underway or completed at Superfund and other hazardous waste sites in Minnesota, Michigan, and New York. The results of a bench scale test performed on site soils are promising. The main advantage of the biotreatment program is its contribution to reducing the time needed to attain the remedial objectives for groundwater by stimulating the in-situ biodegradation of contaminants.

The combination of technologies that comprise the remedy is somewhat unique, as is the site itself. Therefore, three sites with equivalent conditions and the same remedy cannot meaningfully be identified. However, the proposed remedy is judged to be the best method for addressing the contamination at this site.

Issue #5: How much will the remedy cost?

Response: The feasibility study concludes that the present worth of the remedy (in 1991 dollars) is $4,507,000. Stated another way, $4,507,000 deposited into an interest bearing account in 1991, and payed out over the life of the remedy, should be sufficient to fund the remedy.

Issue #6: Will some sort of bond be required to assure that adequate funds are available?

Response: Negotiations are underway between the State of New York and the responsible parties to provide funds for the remedy. If completed, an agreement for the responsible parties to fund the remedy will be incorporated into an order issued by the federal court. If an agreement is not reached, it is likely that monies to remediate the site would initially come from the federal "Superfund." The costs incurred would then be recovered in legal actions against the responsible parties.

Issue #7: Why aren't hazardous waste companies required to post bonds providing for site cleanup?

Response: Under the federal Resource Conservation and Recovery Act (RCRA) and, in this case, New York State laws and regulations, companies that treat, store, or dispose of hazardous wastes are required to provide a financial assurance mechanism to properly close a facility after operations have ceased. Many of these laws and regulations came into effect sometime after the bulk of the operations that led to the contamination of this site, and they were not always complied with after they came into effect.

Issue #8: When will the remedy begin?

Response: Three main things must occur before the remedy begins. A pilot project must be completed to more carefully define the best operating conditions for the biotreatment program. Second, the design of the full-scale remedy must be completed and approved by the State and the USEPA. Lastly, the provisions and conditions for completing the remedy must be agreed upon and incorporated into a consent decree issued by the court. Assuming that a settlement to fund the remedy is obtained by mid-1991, it is anticipated that construction should begin in mid-1992.

II. <u>Issues Regarding Existing Health Effects</u>

Issue #9: What are the cumulative health effects on area residents from the release of contaminants from this site and the other contaminant sources (including potential future sources) in the area?

Response: A number of commentors raised this issue directly or indirectly during the public meeting. In accordance with the requirements of the National Contingency Plan (NCP), the RI/FS evaluated the potential health effects of the release of contaminants at the site assuming that no remedy were implemented. Naturally, this assessment was based upon information gathered during the remedial investigation carried out between October 1987 and March 1990. Therefore, the assessment is site specific and based upon existing, not previous conditions, for which data is not available.

Unfortunately, the performance of a meaningful area wide health assessment would be extremely difficult and well beyond the allowable scope of this project. Determining the contribution of past contamination from multiple sources in the area to current health effects would be essentially impossible. This is due to the lack of adequate environmental data from the past, and the difficulties associated with isolating the impacts from individual sources in the area. However, many conservative assumptions are built into the risk assessment. For example, the on-site resident was assumed to be present at the site, and potentially exposed, 24 hours per day, 365 days per year, for 70 years.

Issue #10: What effects can the contaminants at the site have, and have had, on our health?

Response: Section 3.4 of the Feasibility Study (Toxicity Assessment) discusses the possible effects of exposure to site contaminants. The baseline risk assessment concluded that the existing conditions at the site do not present a significant health risk to off-site residents. This means that the risk of developing cancer from off-site exposure to contaminants migrating from the site and the mudflats is less than one in one million, and that non-cancer health effects are not expected.

In the hypothetical scenario where someone lived on the site for their entire lifetime, that person's incremental risk of developing cancer would be approximately nine in one hundred thousand (compared with an incidence of 28,000 in 100,000 in the general population for all forms of cancer). Non-cancer health effects would not be expected.

Since the data that would be needed to evaluate past conditions is not available, it would be inappropriate to speculate on the effects of past exposures.

Issue #11: Does site contamination threaten the local drinking water supply?

Response: No. Drinking water around the site is obtained through a public water system which is supplied from out of the area. There are no public supply wells within one mile of the site. Contaminated groundwater underneath the site discharges to the west into Hempstead Harbor, away from populated areas and not into aquifers that serve as current sources of potable water.

Issue #12: Does the risk assessment address potential impacts to infants and unborn children?

Response: The risk assessment does address potential impacts to children and adults, but due to the uncertainties inherent in meaningfully evaluating exposures to infants and unborn children, baseline risk assessments do not typically address these populations directly.

Issue #13: Prevailing winds appear to carry air over the site towards local residences.

Response: Since chemicals were removed from tanks and containers at the site during 1985-1986, the remaining contamination is primarily in the shallow groundwater and soils near the water table. After evaluating air emissions from the site under current conditions, the RI/FS Reports conclude that off-site impacts on air quality are not significant.

III. Issues Regarding Hempstead Harbor

Issue #14: Do all chemicals from the site flow into the Harbor?

Response: The results of the remedial investigation indicate that contaminated groundwater does indeed discharge into Hempstead Harbor. This has resulted in a petroleum-like sheen at certain times in the small cove to the west of the site. It is likely that, in the past, significant quantities of chemicals have been released into the harbor. In particular, records indicate that a toluene spill at the site in 1978 released an unknown quantity of this chemical into the harbor. Under existing conditions, calculations indicate that outside of the immediate vicinity of the site, the surface water concentrations of the released chemicals is not significant.

Issue #15: Is it safe to swim at the local beaches?

Response: Although studying local beaches was beyond the scope of this project, the water quality of public beaches is regularly monitored by the County Department of Health. Calculations based on the known concentrations of contaminants in the groundwater, indicate that it is very unlikely that site related contamination would create unsafe conditions at nearby beaches.

Issue #16: What have marine biologists found regarding impacts to flora and fauna around the site?

Response: In 1987, the Office of Marine Ecology of the Nassau County Department of Health produced a report describing the impacts to marine biota resulting from exposure to chemicals released from the site. Species occurrence and abundance data were gathered, along with sediment samples from the mudflats in the western cove. This cove, approximately one acre in size, was divided into three areas: "inner cove," "mid-cove," and "outer cove." The inner cove, along with the adjacent wooden bulkhead, was described as a zone of "severe impact" indicating a lack of expected biota and an inability to support relocated organisms. The mid-cove was described as exhibiting "variable" or "patchy" impacts and the outer cove (which extends to the edge of the site) was described as a zone of "minimal impact."

IV. General Site Issues

Issue #17: Why were the tanks and piping not removed from the site?

Response: The removal action funded by the NYSDEC in 1985-1986 focused on the imminent danger presented by the presence of the chemicals in the tanks, containers, and pipes at the site. Once emptied, the tanks and pipes no longer presented an imminent threat, and it would not have been reasonable to spend public monies to remove them. The owner(s) of the site did not volunteer to remove them.

Issue #18: Why did the site get into the shape it is in?

Response: Contamination of the site resulted from the improper storage and handling of hazardous chemicals and wastes by persons operating the site over an extended period of time.

V. Information Issues

Issue #19: Can local officials be subpoenaed to force them to attend public meetings such as this?

Response: No, they cannot. However, through citizen participation programs, the agencies strive to create the opportunities and circumstances that encourage participation by all affected or interested citizens and officials.

Issue #20: Will there be more public meetings regarding the remediation of this site?

Response: Since the selected remedy does not differ from the proposed remedy, no additional meetings are planned. If significant new issues arise during the course of the remedial program that could impact area residents, notices will be issued and additional meetings may be held.

Issue #21: Will the public be notified when the final remedy has been selected?

Response: Yes. A legal notice describing the selected remedy will be published in local newspapers along with other notices. The Record of Decision will be placed in local information repositories.

Issue #22: Has a date been set for this case to go before the court again?

Response: Yes. Judge J. Weinstein (U.S. District Court, Eastern District of New York) has directed the parties to return to court on July 15, 1991.

The following comments were submitted to the agencies in a letter dated May 23, 1991 from Mr. Donald W. Stever, liaison counsel to a group of parties known as the New Defendants in the litigation involving this site.

VI. Groundwater Extraction and Treatment is Unnecessary

Issue #23: The removal efficiency of any pump and treat system will be quite low because the groundwater concentrations of the target substances are very low.

Response: Groundwater is monitored at three levels at the site; WT-series wells screened at the water table, SW-series wells screened approximately 15 feet below the water table, and DW-series wells screened approximately 50 feet below the water table. There are 22 contaminants in groundwater that exceed groundwater standards. On a mass basis, three contaminants comprise a great majority of the contamination. These are ethylbenzene, toluene, and xylenes, or ETX. The WT-series wells are highly contaminated with many compounds including ETX at concentrations up to 350,000 parts-per-billion (ppb) which is 70,000 times the applicable standard. This results from the fact that most of the contaminants float on the water table and dissolve into the shallow groundwater. The fact that these high levels are not just a sampling artifact resulting from the presence of floating chemicals is evidenced by the presence of high levels of contaminants in wells where there is no floating chemical or sheen. The SW-series wells are contaminated with relatively low levels of chlorinated organic compounds at concentrations up to 60 times the applicable groundwater standard. The DW-series wells are uncontaminated.

Therefore, the upper 15 feet of the aquifer is highly contaminated by volatile non-chlorinated organic compounds. Chlorinated organic compounds are present at relatively low levels at the 15 foot level and at relatively high levels closer to the water table.

The extraction and treatment program will focus on the upper 15 feet of the aquifer and will address both contaminated groundwater and saturated soils. Removal efficiencies are expected to be good.

The ROD states that if monitoring indicates that continued operation of the remedy is not producing significant reductions in the concentrations of contaminants in soils and groundwater, the NYSDEC and the USEPA will evaluate whether discontinuance of the remedy is warranted. The criteria for discontinuation will include an evaluation of the operating conditions and parameters as well as a statistical determination that the remedy has attained the feasible limit of contaminant reduction and that further reductions would not be technically feasible or needed to be protective of human health or the environment.

Issue #24: The imposition of groundwater standards to this site is arbitrary and capricious for the following reasons:

a. the contaminated aquifer is not a current or potential future source of drinking water;

b. groundwater discharges to the harbor and does not recharge aquifers used for drinking water;

c. any attempt to utilize site groundwater would result in salt water intrusion making the aquifer unusable;

d. soil venting will eliminate any threat of significant concentrations of ETX from discharging and creating a sheen on the mudflats and will prevent the presence of detectable levels of contaminants in the harbor at the point of discharge; and

e. it is not cost effective.

Response: Rather than being arbitrary and capricious, the application of groundwater standards as remedial goals at this site is a straightforward application of a regulation in place since 1978 (6 NYCRR 703.5). This regulation states that the best usage of fresh ground waters is as a source of potable water supply. Federal law and regulations provide that an applicable standard may be waived only if one or more of six grounds are met (ref. 40 CFR 300.430 (f)(1)(ii)(C) of the NCP). Of these six, the only potentially applicable waiver would be that complying with the requirement would be technically impracticable from an engineering perspective. Since the reduction of volatile contaminants in groundwater is practical as well as practicable, this waiver cannot be invoked.

Although it is unlikely that shallow groundwater from the site would be used as a source of drinking water, other uses that could expose users to contaminants cannot be ruled out. For example, a nearby country club uses groundwater from the upper aquifer for refrigeration and irrigation (gardening, etc.).

Although any off-site withdrawal wells capable of drawing in contaminated groundwater from the site would also induce salt water intrusion from the harbor, on-site withdrawal wells would not necessarily induce salt water intrusion. Therefore, it is not true that any use of site groundwater would induce salt water intrusion.

Without extracting and treating groundwater, highly contaminated shallow groundwater will continue to discharge to the harbor. At the point of discharge, contaminants would certainly be above detectable levels. Since the saturated soils associated with the shallow groundwater are also contaminated, chemicals would continue to leach from the soil into groundwater for many years, probably decades.

The criterion of cost effectiveness cannot properly be addressed until after the threshold criteria for selecting a remedy have been met. One of those criteria is that the remedy meets all applicable or relevant and appropriate requirements (ARARs). As discussed above, groundwater standards are applicable standards at this site. Therefore, the "cost effectiveness" of a remedy that does not address this threshold criterion is not meaningful.

VII. Off-Site Source(s) of Contaminants

Issue #25: The ROD should indicate that the chlorinated organic contaminants (COCs) found in the SW-series wells come from an off-site source for the following reasons:

a. COCs are found in monitoring wells near the upgradient boundary of the site;

b. COCs are not identified as contaminants of concern;

c. COCs are not found in soils; and

d. remedial costs would be significantly increased by attempting to remediate COCs in the SW-series wells.

Response: The only method for determining whether COCs found on-site come from one or more upgradient, off-site sources is to obtain a sample of upgradient, off-site groundwater. No existing wells qualify for this role. COCs have indeed been identified as contaminants of concern as have all contaminants found in groundwater at concentrations above the applicable standards. COCs have been found in varying concentrations at all soil levels on the site, and in locations not necessarily indicating an off-site source (see RI Report figures 10, 12, 18, & 19).

It is true that it would not be appropriate to attempt to remediate a source of contamination located upgradient of the site solely by on-site collection and treatment of groundwater. For this reason, the ROD calls for the installation of an appropriately located monitoring well to determine if there is an upgradient contributor to contamination at the site. In addition, the ROD does not require additional treatment designed specifically to treat the COCs. Potential additional costs would be realized only if the length of treatment is extended to remove COCs. However, by that time, the source of COCs should be clarified.

The following comments were submitted to the agencies in a letter dated May 23, 1991 from Mr. George R. Lawrence.

VIII. Other Contributing Sources

Issue #26: What is the petroleum contribution from the existing asphalt covering?

Response: The existing asphalt covering over portions of the site is not considered a significant source of petroleum related contaminants. The quantities of contaminants potentially leached from weathered asphalt are extremely small in comparison to the quantities of contaminants found on-site.

Issue #27: What is the expected contribution of petroleum compounds from storm water discharge to the inlet, since tides and prevailing winds tend to drive floatables on to the mud flats?

Response: As with the contribution from the existing asphalt, the contribution of petroleum contaminants from area storm water discharges is not considered significant. While such storm water discharges might slightly contribute to sediment contamination on the mud flats, they do not contribute to the soil contamination that is the principal threat at the site. Additionally, the contamination found in the sediments is not the primary reason for remediating the site.

Issue #28: How much contribution from the Port Washington landfill, either floatable materials or groundwater, is expected to end up at the site?

Response: No modeling has been performed to try to quantify the potential contribution of contaminants from the Port Washington landfill to the site. However, as with the storm water discharges, any contribution would affect only the sediments, rather than the site soils and groundwater that are far more contaminated.

Issue #29: The Northeast section has been determined to have high readings on the photoionization detector. How much investigation will be done to determine the source?

Response: The northeast corner of the site exhibited elevated soil gas readings in the first soil gas survey. As explained in the Remedial Investigation Report, additional surveys were performed to confirm this unexpected finding. The two subsequent surveys found background soil gas readings in this area, leading to the conclusion that the initial survey was not representative of actual conditions. No further investigations will be performed.

Issue #30: The cross sections indicate that there is contamination north of the Site. There is not enough up-gradient information to determine the origin of the contamination. Will additional test wells be installed to locate and quantify the source of this contamination?

Response: The cross sections indicate only that there is contamination in the furthest upgradient on-site wells. The information currently available is not sufficient to determine whether the contamination found in those wells is from an on-site or off-site source. Some additional work will be performed, including installation of at least one upgradient monitoring well, to make that determination.

Issue #31: Page 3-13 of the RI states that "the three detections of airborne benzine (sic) which could result from volatilization of the Site compounds migrating through bulkheads and over the tidal flats may also be attributed to the adjacent terminal operations." Has this possibility been investigated and if so, what were the results?

Response: The quoted text is actually found at Page 3-13 of the Feasibility Study. No investigation beyond that reported in the RI/FS has been performed. The work necessary to isolate the contamination contributed by the adjacent oil terminal is not warranted, since it would not affect remedy selection at the site.

Issue #32: Page 61-1 of the RI states that "the results of this survey conducted during May, 1990, indicated background reading through the northern portion of the Site, consequently this data is not considered representative of soil vapor conditions." This set of readings is significant if contamination is entering from upgradient areas. When will an investigation be conducted to determine the source of this vapor?

Response: As explained in the response to Issue #29, the northeast corner of the site exhibited elevated soil gas readings in the first soil gas survey. Additional surveys were performed to confirm this unexpected finding. The two subsequent surveys found background soil gas readings in this area, leading to the conclusion in the Remedial Investigation Report that the initial survey was not representative of actual conditions. No further investigation will be performed (see also Issue #30).

Issue #33: The RI indicated that low PPM of chlorinated solvents in SW-1 "May be from off Site since SW-1 is generally down gradient from SW-6". If this is true, what affect would this off site contaminant have on remediation? Why hasn't it been confirmed?

Response: As evidenced by use of the word "may", an off-site source of contaminants is suggested but not proven. If it is true that off-site sources contribute to groundwater contamination at the site, that would not affect the preferred alternative. The preferred alternative was selected for its ability to effectively treat the variety of contaminants found at this site. As noted above (see Issue #30), some investigation to determine whether or not there are off-site sources of contamination is planned.

Issue #34: The proposed remedial action plan page (6 and 7) indicates that the SW series wells screened at the C + D soil horizons contain chlorinated organic compounds that "may be the result of off site contamination". There are no adequate up gradient wells to confirm or disprove this. What action has been proposed to determine the source of contamination, to prevent recontamination of the remediated areas and to investigate the upgradient areas?

Response: This issue has been addressed in the response to Issue #30.

Issue #35: Because of the nature of the Harbor Fuel operations, it is possible that they may have contributed to the groundwater contamination. Are there sufficient test wells installed to measure the quality of the groundwater that flows from the Harbor Fuel property onto the Site?

Response: Although the Remedial Investigation did not attempt to determine the direction of groundwater flow on the Harbor Fuel property, considering the water table configuration on-site (Figure 2-2 in the FS) and the location of the Harbor Fuel property, groundwater does not appear to flow from Harbor Fuel onto the site. This conclusion is supported by the absence of petroleum related contaminants from the furthest upgradient wells.

Issue #36: The RI identifies the Penetrex Site as an inactive hazardous waste site. This site is upgradient from the Shore Site so there is a possibility of contamination from it. What steps have been taken to investigate contamination from the Penetrex Site? Are there any monitoring wells on the Penetrex Site and if so, what do test results indicate? Are the contaminants on the Penetrex Site the same as those discovered on the Shore Site?

Response: The Penetrex Site has been considered, and does not appear to contribute contaminants to the Shore Site. An examination of the data from the Penetrex Site indicates that groundwater flows to the west and discharges to Hempstead Harbor. Although some of the same chlorinated volatile organics found at the Shore Realty Site are also found at the Penetrex Site, Penetrex is located north of Shore and is not upgradient. Therefore, it is not likely to affect groundwater quality at the Shore Site.

IX. GROUNDWATER CONTAMINATION:

Issue #37: Page 4-17 of the Feasibility study states that attaining the state Maximum Contaminant Level (MCL) would not be practical. How is this reconciled with the State's objective of attaining drinking water quality groundwater?

Response: EPA and NYSDEC believe that the preferred alternative is a practical remedy capable of achieving State MCLs in the groundwater. The FS states at page 4-17 that remedial options which "guarantee" reaching MCLs are technically impractical. However, the selected remedy is workable and has the potential to reach MCLs if implemented and operated properly and proceeds as expected. No remedy is 100 percent "guarantee[d]."

Issue #38: How was it determined that groundwater beneath the mudflats rises from the lower areas to the upper areas (except for the first 10-20 feet)? Any dissolved or free product is most likely to be near the surface. What is the affect of the tide on groundwater movements and this product?

Response: The determination regarding vertical flow of groundwater under the site is based on hydrographs comparing the groundwater levels in the deep, shallow, and water table wells. The groundwater flow direction under the mud flats was not predicted but multilevel sampling/analysis shows that the concentration of contaminants does not increase with depth. The upper portion of the aquifer below the site undergoes a reversal of vertical flow direction with each tidal cycle, while the deeper portions of the aquifer exhibit a constant upward flow. The tide does affect groundwater movement in the upper portion of the aquifer. At the water table, the groundwater elevation fluctuates only a few inches with each tidal cycle. This movement tends to spread the floating product across a narrow band of soil in the upper aquifer. That narrow band will be dewatered under the preferred alternative, and decontaminated by the soil venting system.

Issue #39: If the groundwater is rising where is it coming from, upland areas behind the Site (upgradient) or is it rising up due to the buoyancy of fresh water on the salt water interface?

Response: The groundwater is probably coming from upland areas, although the Remedial Investigation did not perform a study of the regional groundwater flow regime.

Issue #40: Since the 1988 report, the line of contamination has progressed toward Hempstead Harbor with the subsequent reduction of contaminants in the upgradient areas of the Site. This indicates that the natural flushing of 1989-91 removed a good deal of the groundwater contamination. How long will it be before the Site is purged of contaminants and meets state standards if natural remediation is allowed to continue unaided by other remediation methods?

Response: It is not possible to accurately estimate the length of time necessary for the site to naturally remediate to meet ARARs. This option was considered as Alternative I - No Action in the Feasibility Study, and was rejected due to uncertainty that ARARs would ever be achieved, and the unacceptable length of time for remediation under the most optimistic assumptions. Experience at other hazardous waste sites indicates that as contaminant concentrations drop the process of natural remediation slows, typically taking decades at sites with heavy contamination such as this site.

X. NEED FOR REMEDIATION

Issue #41: The hazard index for this Site is less than one (1). This is below the threshold for posing a health risk. Why then is it necessary to do subsurface remediation?

Response: The hazard index is only one indicator of the need for remediation and addresses only non-carcinogenic health effects. The Remedial Investigation found concentrations of contaminants in the groundwater at concentrations exceeding the health based New York State groundwater quality standards, and estimated an increased cancer risk of 9×10^{-5}. These findings clearly indicate the need for remediation of the site. The only way to remediate the site is to remediate the subsurface contamination that is the source of contamination at the site.

Issue #42: The remedial action plan stated that Site impacts on animal and marine life appear to be limited to the bulkhead and sediments directly adjacent to the Site. Why does the State propose to remediate the entire Site if only a small percentage of the property is now considered impacted? Harbor Fuel Oil is adjacent to the Site and the Port Washington Landfill is across the harbor. Do these facilities have an impact on the animal and marine life near the Site?

Response: Impacts to marine life on the bulkhead and sediments were not the only documented environmental impacts at the site. Other media at the site are also significantly impacted. Contaminated soils are the source of contamination impacting groundwater, sediments, surface waters, and air at the site. Only by removing the source of contamination can impacts to all the other media be remediated. The question regarding the Harbor Fuel Oil Terminal and Port Washington Landfill has been previously addressed under Issues 29 and 34. Additionally, the contamination found in the sediments is not the primary reason for remediating the site.

XI. SURFACE WATERS

Issue #43: The Report states that at low tide, a "sheen is visible on the mudflat next to the Site." Is this unique for the mudflats in Hempstead Harbor? Do other mudflats in the Harbor experiences similar "sheens"? And if they do, how is the origin of the materials forming the "sheen" determined?

Response: The Remedial Investigation did not include an examination of other mudflats for a sheen. Based on observations at the Site, the sheen that appears is a result of groundwater discharge through the wooden bulkhead. The sheen results from the non-aqueous phase liquids (NAPL) floating on the surface of the groundwater. The NAPL sheen is a violation of New York State surface water quality standards.

XII. FUTURE USE OF THE SITE

Issue #44: The plan for the clean-up was based on the standard that a person could live on-site for 24 hours a day for 70 years and not be at risk. The Town of North Hempstead has zoned the site a "Business B District". The town zoning regulations do not permit residential housing in a "Business B District." It is well established that zoning authority is retained by local government unless the State has a justifiable reason to preempt. In this case, the plan is requiring a clean-up standard compatible with a residential district. Why has a clean-up standard been chosen that is in conflict with the town zoning? Why wasn't a clean-up standard chosen that would be more consistent with the use of property zoned as a "Business B District"?

Response: The cleanup standards chosen for this site are based on State and federal law, and neither conflict with nor preempt local zoning. Cleaning up a site to a standard allowing future residential use does not require the town to rezone for residential use. However, if future changes in local zoning open this site for residential development, which is possible given the history of the site and the waterfront location, the cleanup must be protective of human health.

Issue #45: The risk assessment for this Site factored in future use by human inhabitants. However, the risk assessment did not include the possibility of restricting the use of the land by a covenant to the deed. A covenant could regulate human presence on the Site by permitting only certain activities. This would be consistent with the town zoning of the Site as a "Business B District". Limiting the future uses of the Site would greatly reduce the remediation costs. Why wasn't this possibility considered?

Response: The National Contingency Plan (NCP) states that:

> The use of institutional controls shall not substitute for active response measures (e.g., treatment and/or containment of source material, restoration of ground waters to their beneficial uses) as the sole remedy unless such active measures are determined not to be practicable, based on the balancing of the trade-offs among alternatives that is conducted during the selection of the remedy.

Deed restrictions are considered institutional controls, and are inherently less effective than site remediation. During the selection of the remedy for this site, the use of treatment was determined to be practicable based on the balancing of tradeoffs mandated under federal law. Therefore, institutional controls could not be considered. Regardless of future use, groundwater under the site must be remediated to comply with groundwater quality standards, so cost would not be affected by limiting future use of the site to industrial activity.

XII. PREFERRED ALTERNATIVE

Issue #46: Remedial alternative VI proposed depressing the water table approximately 3 feet by a pumping operation. Where will this water be pumped to? Will this water be treated to remove contaminants? What is the estimated volume of water that will be pumped?

Response: The water will be treated by air stripping or an equivalent process. A portion of the treated water will be used in the biodegradation system, and the remainder will be discharged either to the local wastewater treatment plant or directly to the harbor. In either case, the discharge will be treated and monitored to ensure compliance with all applicable discharge standards. The Feasibility Study estimates a pumping rate between 10 and 30 gallons per minute. A more reliable estimate will be developed as part of the remedial design.

Issue #47: Remedial alternative VI proposes the addition of nutrients and oxygen into treated water before it is reinjected into the site. What method would be used for the reinjection? Where on the site would the reinjection be done? On other sites, deep well injection has not worked because of screen load up by biological organisms at the discharge point. Has this problem been investigated and if so, what were the findings? What affect will the injection have on the pumping operation for lowering the water table?

Response: The method of reinjection will be determined during system design, but will probably involve wells, well points, trenches, or a combination of all three. Reinjection will probably be done in the northeast portion of the site, and at the toe of the slope on the western side of the site as shown in Figure 5-5 of the Feasibility Study. A survey of bioremediation work did not reveal any obstacles to reinjection that cannot be overcome by proper selection and design of the reinjection system. Reinjection and pumping rates will need to be properly balanced to maintain the desired depression of the water table and adequate flow of nutrients to the saturated zone.

Issue #48: Remedial alternative VI proposes the treatment of "both saturated and unsaturated soils". Does this mean that all of the soil on the Site will be treated? Or does it mean that only specific areas of the Site with significant concentrations of contaminants will be treated? If so, what areas will be treated and what is the criteria for choosing these areas?

Response: Soil venting to treat unsaturated soils will be performed in the central elevated area around the storage tanks, and down the slope to the west and southwest as shown in Figure 5-5 of the Feasibility Study. Biodegradation will treat saturated soils in roughly the same area as the soil venting. These areas were selected based on the concentrations of contaminants found during the Remedial Investigation, and encompass all of the areas of significant contamination. The precise areas will be further defined during remedial design.

Issue #49: The lower elevations of the Site have a history of flooding to a depth of 2 to 3 feet during spring tides when there are high off shore winds. What affect would this flooding have on the remediation plans in general and the in-situ biodegradation portion in particular? The RI shows that the largest concentration of contaminants are in the low lying areas that are most susceptible to flooding. Is it prudent to introduce biodegradiants to soil that will be flooded by salt water? What affect does salt water have on the biodegradiants that the RI proposes to use?

Response: The potential for flooding will be considered in the design of the systems that will be placed on the low lying areas of the site, but does not affect the remediation plans in general. The proposed biodegradation process involves the injection of only nutrients and a source of oxygen into the groundwater. Complex interactions resulting from the infiltration of salt water are not expected. However, the possibility can be examined during remedial design.

XIII. HYPOTHETICAL SITUATION

Issue #50: If a legal hazardous waste operation was operating on the Site, would the presence of one (1) Part Per Billion of Benzine (sic) on the mud flats be acceptable to the State?

Response: It is not appropriate to address such a hypothetical situation without additional information. The Site requires remediation because it presents a significant threat to human health and the environment and does not comply with ARARs, not solely due to the presence of benzene on the mud flats.